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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

HEARINGS BEFORE THE COMMITTEE ON ARMED SERVICES UNITED STATES SENATE NINETY-SEVENTH CONGRESS

FIRST SESSION

ON

S. 815

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 1982, FOR PROCUREMENT OF AIRCRAFT, MISSILES, NAVAL VESSELS, TRACKED COMBAT VEHICLES, TORPEDOES, AND OTHER WEAPONS, FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, AND FOR OPERATION AND MAINTENANCE FOR THE ARMED FORCES, TO PRESCRIBE THE AUTHORIZED PERSONNEL STRENGTH FOR EACH ACTIVE DUTY COMPONENT AND THE SELECTED RESERVE OF EACH RESERVE COMPONENT OF THE ARMED FORCES AND FOR CIVILIAN PERSONNEL OF THE DEPARTMENT OF DEFENSE, TO AUTHORIZE THE MILITARY TRAINING STUDENT LOADS, AND FOR OTHER PURPOSES

PART 7 STRATEGIC AND THEATER NUCLEAR FORCES CIVIL DEFENSE

FEBRUARY 18, 20, 25, 27, MARCH 4, 6, 11, 30, 1981



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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, FEBRUARY 18, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

POLICY, THREAT, AND IMPLEMENTATION

The subcommittee met in executive session, pursuant to notice, at 8:37 a.m., in room 212, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Staff present: James F. McGovern, general counsel; William L. Ball III, chief clerk; Frank Gaffney, Edward B. Kenney, Ronald F. Lehman, E. George Riedel, James C. Smith, Francis Sullivan, professional staff members; Brenda K. Hudson and Judith P. Hunt, clerical assistants.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Arnold Punaro, assistant to Senator Nunn; Greg Pallas, assistant to Senator Exon; and Willis Smith, assistant to Senator Jackson.

OPENING STATEMENT OF SENATOR JOHN WARNER, CHAIRMAN

Senator WARNER. General Ellis, we welcome you and Admiral Carr.

Today I wish to extend a very warm welcome to Gen. Richard H. Ellis, Commander-in-Chief of the Strategic Air Command, and to Vice Adm. Kenneth M. Carr, Vice Director of Strategic Planning, Joint Strategic Target Planning Staff.

This is the very first meeting of the Subcommittee on Strategic and Theater Nuclear Forces. For that reason, it is especially appropriate that our first witnesses should be from the Strategic Air Command.

We have asked General Ellis to appear before us to discuss the state of our strategic deterrent and nuclear forces as viewed from his unique perspective as operational commander of SAC and head of the Joint Strategic Target Planning Staff.

Some subcommittee members will recall General Ellis' thought-provoking and even alarming testimony last year. I have every confidence that he will be as candid and forthright in giving us the

facts as he sees them in our session today as he was in his earlier appearance.

I wish also to welcome the other new members of the committee and especially Senator Jackson. His experience will be of great value.

The mandate given this subcommittee is compelling. We are to address strategic and theater nuclear issues from the initial formulation of doctrine, through the development of new weapon systems to their procurement, deployment and, ultimately, retirement. We will also be responsible for oversight related to the Department of Energy national security programs, certain intelligence-related activities and most major arms control initiatives.

The magnitude of the problems we must examine is great; therefore, we must work together in the spirit of cooperation and teamwork.

The decline in American strategic nuclear strength in recent years can be attributed to two factors: first, the greater than expected magnitude of the Soviet military buildup and, second, delays in America's strategic modernization.

Today we are alarmed by Soviet numerical advantages in land- and seabased ballistic missiles. These great numbers alone, however, would not be so threatening were they not accompanied by Soviet modernization of their forces using the latest technologies.

In the next few years the Soviet Union may well have a large advantage over the United States in every significant measure of strategic nuclear power, static or dynamic. Today the Soviet Union already possesses strategic forces whose destructive power is so much greater than that possessed by the United States that by some calculations the Soviet Union could attack and destroy our present land-based missiles and retain in their reserve a greater destructive capacity than the United States possessed before the attack began.

America's much vaunted strategic Triad is in trouble. The ability of our present strategic bombers to penetrate Soviet air defenses at the end of the decade remains uncertain, just as the prelaunch survivability of our planned cruise missile carriers is in doubt.

MANNED STRATEGIC BOMBER

A major issue before the subcommittee this year will be the future of the manned strategic bomber. By now, nearly every American is aware of the potential vulnerability of the Minuteman ICBM force. This year the subcommittee must face head on the question of ICBM vulnerability. Even our sea-based deterrent, which has been the most survivable leg of the Triad, is undergoing turmoil.

The *Ohio*, our first Trident submarine, was authorized in fiscal year 1974 for delivery to the Navy 2 years ago. Today there is some doubt that the *Ohio* will actually be delivered before the end of this fiscal year.

In recent years we have seen our strategic posture transformed from one of "massive retaliation" through "sufficiency," "parity," "essential equivalence" and "rough equivalence" to the "imbalance" and perhaps inferiority which characterizes the so-called "window of vulnerability" which will exist until the deployment of the MX missile.

As the operational commander responsible for our strategic nuclear forces, General Ellis is uniquely qualified to comment on the strategic balance today. For him, deterrence is not simply funding profiles for future weapon systems; it is a day-to-day responsibility.

General Ellis is scheduled to testify this afternoon before the Preparedness Subcommittee. Consequently, it is the Chair's hope that by observing the 10-minute rule faithfully we can have a full discussion and every Senator will have ample opportunity to get into matters of interest to him with General Ellis.

Of course, any Senator having important additional questions may submit them for the record. For that purpose, the record will remain open until 5 p.m. today.

We will proceed with your opening statement, which, I understand, is unclassified; however, we are now in executive session and will continue in executive session.

Thank you, General.

STATEMENT OF GEN. RICHARD H. ELLIS, USAF, COMMANDER IN CHIEF, STRATEGIC AIR COMMAND, ACCOMPANIED BY VICE ADM. KENNETH M. CARR, USN, VICE DIRECTOR, STRATEGIC TARGET PLANNING, JOINT STRATEGIC TARGET PLANNING STAFF

General ELLIS. Mr. Chairman and Senator Goldwater, we are honored to be the lead witnesses for your hearings this year. I have with me Vice Admiral Carr, who is the Vice Director of the Joint Strategic Target Planning Staff. He appears in that capacity, however, Admiral Carr is an experienced submariner. His last job was a commander, Atlantic Submarine Forces, and while he would not be in a position to speak for the Navy, he certainly is qualified on the sea-based element of the Triad.

As I indicated, the first part will be unclassified. I will then ask Admiral Carr to give a very brief summary of how we put together the nuclear war plan for the United States.

Then we would like to present an update of the threat in a dynamic fashion.

Members of this committee saw the basic element of this presentation last year. We would like to bring you up to the 1981 position and show you our projection for 1985 and 1990.

Senator GOLDWATER. Pardon me, General. I hate to interrupt, but does Admiral Carr work with the Air Force on strategic targeting, or is Navy targeting separate?

General ELLIS. It is one organization. It is a joint staff, Senator. He involves himself in air and sea and ICBM.

Senator GOLDWATER. Thank you.

General ELLIS. A serious strategic imbalance currently exists between the United States and the Soviet Union and, under current programming, will continue to exist to some degree throughout the decade. Correcting this imbalance must be the Nation's top priority in the immediate years ahead.

At the heart of the U.S. deterrent concept is the strategic Triad, a diversified mix of land- and sea-launched ballistic missiles and

manned penetrating bombers. If properly balanced and modernized, the Triad poses insurmountable problems to an aggressor. However, the central systems of the Triad, initially deployed in the 1950's and 1960's, long ago started to become noncompetitive in a world of constantly advancing weapons technology.

Program delays, cancellations and stretchouts have combined through the years to reduce the total effectiveness of America's retaliatory capability. The Triad's built-in compensation factor to offset temporary weaknesses in the individual elements is quickly approaching maximum elasticity. For these reasons, we must insure each element is upgraded to the point that no single leg loses its effectiveness or becomes vulnerable.

SAC's Triad responsibilities center on the manned penetrating bomber and the intercontinental ballistic missile, ICBM. Concurrently, we rely heavily on the Nation's command, control, communications and intelligence—C³I—network to help fulfill these responsibilities. Because of their importance, I will discuss each of these three in more detail.

MANNED PENETRATING BOMBER

Let me begin with manned penetrating bombers. For the past 4 years it has been suggested that the high technology, air-launched cruise missile, ALCM, in and of itself could serve to adequately maintain the effectiveness of the air-breathing leg of the Triad. I do not agree.

Although the ALCM will be a valuable supplement to the bomber, it is only a weapon, not a central weapon system. It cannot duplicate the many advantages inherent in manned penetrating systems developed and refined over the last 40 years.

For more than a quarter century, the B-52 has been the mainstay of the bomber force; however, time and technology have passed it by and, in the very near future, the B-52 must be relegated to a standoff role. As SAC previously recommended, the B-52G models should convert to ALCM carriers in the mid-1980's, followed by the newer B-52H models by the end of the decade. As the B-52 transitions from pure penetration to that of shoot and penetrate, to, finally, all standoff, we must design, develop, and deploy a follow-on bomber.

During the closing hours of the 96th Congress the absolute need to select a replacement for the B-52 was recognized and defined. At that time, the Department of Defense, DOD, was directed to develop a comprehensive bomber modernization plan and make its recommendations for a follow-on bomber by March of this year. SAC obviously has great interest in the outcome of the DOD study and the recommendations that will be made. In my judgment, if the March deadline proves unworkable it would be wiser to delay finalizing the study results 1 or 2 months rather than hastily arrive at conclusions which later might be contradicted or invalidated.

After careful evaluation of all available threat data and recent advancements in aviation technology, SAC believes the best course of action is a two-bomber program. Let's examine this recommendation in more detail.

The most pressing requirement is to prepare for the long term, 1990 and beyond. To do this right we should start now to develop a new technology bomber with the earliest possible initial operational capa-

bility, IOC. This new strategic bomber must have the capability to penetrate the projected defense environment of the Soviet Union into the next century.

Our studies show that, if we act now to take advantage of significant new technologies, bombers will be able to penetrate even the most sophisticated radar defenses. Over the next few years, great improvements will be seen in propulsion, reduced aircraft weight, nonreflective composites, dramatically lower radar and infrared signatures, improved countermeasures and refined avionics. Air Force studies and preliminary development work indicate that these new technologies are ready for melding into a strategic penetrator with the required characteristics and capabilities.

If the Air Force could field a bomber that embraces these new technologies by the mid-to-late 1980's, a two-bomber program would not be necessary. However, those responsible for the Air Force's technological programing say that a sound planning date for the first operational squadron of such penetrators is 1990. Because new technologies have the potential to cause radical changes in the aerodynamic characteristics of aircraft, it would not be prudent to bypass the extensive systems testing that should accompany the introduction of such technologies. This, then, brings us to the second part of SAC's bomber program.

For the past 2 years, SAC has recommended the early deployment of an interim bomber to offset the serious near-term threat posed by the Soviet Union and meet the dictates of national guidance. The candidate aircraft for the interim bomber have been narrowed by the Air Force to two: Either a modified FB-111—designated the FB-111B/C—or some version of the B-1. Let me emphasize that the real issue we are faced with is not which aircraft is selected, but, rather, that all concerned recognize the urgent need to make an early production decision on the interim penetrator.

SAC will make its recommendation to Defense authorities on the preferred interim penetrator when the congressionally directed evaluation is completed. At the present time, SAC continues to believe the final decision will turn on earliest availability and lowest cost.

Many strategic imperatives will be vying for a limited number of dollars—the MX, the ALCM, the Trident, reengined KC-135 tankers and the Poseidon retrofit. Yet we see no other workable alternative than to acquire an interim penetrator for the 1980's while we continue to push ahead with the development of a new technology bomber. But, if one of the bomber programs must yield to fiscal limitations and only a single bomber program can be pursued, it should be the new-technology bomber. However, the increasing strategic imbalance, ongoing Soviet adventurism, and the high risk associated with a new-technology bomber prematurely introduced causes me to strongly advise against such a course of action.

LAND-BASED INTERCONTINENTAL BALLISTIC MISSILES

Now, let me discuss ICBM vulnerability and why this Nation needs a land mobile ICBM force.

The sharpest changes in the strategic balance that occurred during recent years were due to massive improvements in Soviet ICBM sys-

tems. The Soviets have made tremendous improvements in warhead accuracy and dramatically increase their multiple independently targetable reentry vehicle (MIRV), equipped force with the fielding of their large SS-17, SS-18, and SS-19 systems. The combined effect of improved warhead accuracy and increased MIRV capability threatens the survivability of our Minuteman and Titan force. Because ICBM forces are the centerpieces of both superpowers' strategic force structure, we must correct our vulnerability by deploying the MX in a mobile basing configuration.

As MX full-scale engineering development progresses, the command continues to believe our operational requirements are covered. Specifically, these are:

The missile's throw weight must be adequate to allow future growth in the number and size of warheads.

The system's command and control must insure fast reaction, endurance, and high alert rates.

The basing mode selected must permit growth or contraction of the system to meet future threats or negotiated arms reductions without compromising the basic deployment concept.

System mobility must provide a hedge against any unpredictable threats that could develop in future years.

Finally, established human and natural environmental criteria must be met.

While the new administration reviews the MX program, it is important that the current development schedule be maintained since all of us are very much aware of the 2-year slip that occurred in the IOC while the last administration evaluated the program. Finally, it is becoming apparent that arms reduction policies permitting some simplifying of the deployment mode is possible at reduced cost and without compromise of operational characteristics.

STRATEGIC CONNECTIVITY

This brings me to the final area I want to discuss, command, control, communications, and intelligence systems.

To satisfy the policy requirements of PD-59 and to realize the full potential of modernized strategic weapon systems, we must also make corresponding improvements to the C³I systems that support them. The entire military capability of this Nation is bound together by a network of high technology telecommunications systems. Unfortunately, they are essentially soft, fragile peacetime systems that were conceived in the late 1950's and put into operation in the 1960's. Most are located at fixed sites or depend on ground communication networks; and, like all terrestrial sites, they are highly vulnerable to attack and destruction.

The fragile nature of our current system was highlighted in a recent Joint Chiefs of Staff, JCS, connectivity study. One of the most pressing areas of concern is the high stress placed on our C³I system by Soviet submarines which patrol off both of our coasts. These submarines, because of their close proximity to Washington and coastal military installations, greatly decrease the amount of warning time and decision time available.

National policy requires that our C³I system be survivable, enduring and two-way. That is the requirement; but Congress and the Defense Department have experienced considerable difficulty in agreeing on the best way to meet this requirement.

I suggest that a major flaw exists in the way our Nation manages its massive C³I network. There is no single governmental agency at the appropriate level that has the capability and responsibility to lay out a comprehensive plan for the future. Management responsibility for the various elements of C³I has been fragmented through DOD. The situation is further exacerbated by the diffusion of telecommunications responsibility among other executive branch agencies, the Federal Communications Commission (FCC) and the large commercial companies. Although PD-59 addresses the general requirement for national security telecommunications, it stops short of assigning full responsibility to a single currency.

Therefore, I believe planning and operational direction for the Nation's telecommunications network, upon which our national security is dependent, should be brought under the management authority of a single high level organization. This is a national requirement and must be addressed at the national level.

With the full understanding that considerable study and evaluation are still required, I recommend creation of a national security communications organization with the authority to pull together the military C³I network throughout the executive branch. Such an organization could implement the spirit, as well as the letter, of PD-59.

In conclusion, there are, of course, many other strategic issues which could be discussed; however, I believe the ones I have mentioned are of greatest importance.

The President and his administration have made it clear they intend to set a new course for America as we prepare to enter the extremely dangerous period which lies ahead. I say dangerous, not only because of our strategic retaliatory capability will be at a disadvantage vis-a-vis that of the Soviet Union, but also because of the potential Soviet response when they realize that this Nation does, indeed, intend to remain a strong international power, protect its worldwide national interests and resist Soviet coercion wherever it may occur.

An assessment of the future leads me to believe that the best hope for international stability and world peace remains with negotiated arms reductions. However, if we are to be successful in these negotiations, we must send our negotiators to the bargaining table against a backdrop of strategic modernization in progress. This is what our adversaries understand and respect.

The task now falls to you, the elected representatives of the people, charged by our Constitution with providing for the common defense, to resolve the many conflicting priorities and help lead our country through this difficult period in its history. I urge you to see that among these priorities the most urgent relate to our Nation's security.

Thank you.

Senator WARNER. Thank you, General Ellis.

[The prepared statement of General Ellis follows:]

PREPARED STATEMENT OF GEN. RICHARD H. ELLIS, USAF, COMMANDER-IN-CHIEF,
STRATEGIC AIR COMMAND

INTRODUCTION

Mr. Chairman, Members of the Committee: I welcome the opportunity to appear before this important Committee and report on SAC's strategic force posture. SAC's recently completed "Global Shield 81" exercise proved that we are capable of generating retaliatory forces as directed by higher authority. This is the underpinning of America's strategic deterrent.

What continues to deter the Soviet Union is credible military strength . . . and the unquestionable capability and will use that strength if necessary . . . at any time, under any circumstance and, most importantly, under minimum warning conditions. Therefore, our readiness must not be in question. If the simulated international crisis of Global Shield 81 had actually occurred nearly 100 percent of SAC's planned force of manned bombers and intercontinental missiles would have been prepared to strike their targets.

Such force is necessary to counter any threat posed to our national security. Today, however, the threat is greater than at anytime in the past—and it gets worse in the decade ahead. The deteriorating strategic balance threatens national security and places the U.S. in a position of playing "catch-up" in order to restore the nuclear balance.

What concerns me most is the question—When and how will we "catch up"? Our analyses show that [deleted]. By balance I mean force capable of denying the enemy any advantage from initiating a nuclear war by inflicting unacceptable damage to him in retaliation. The answer to the question centers as much on identifying near and far term Triad modernization programs as on the way to buy these programs. It is a national problem that requires national commitment.

As Commander in Chief responsible for two legs of the Triad, let me make my position clear:

MX must be our first priority.

The strategic manned penetrator remains critical for an effective Triad.

The immediacy of the near term threat demands an interim bomber.

We need an advanced technology bomber for the 1990's, and

Without an effective C³I network—strategic modernization does not regain needed capability.

Force modernization has become a necessary investment. Our job is to ensure we receive the most return for the money invested. This can be accomplished by optimizing production capability. Such an approach will enable us to exploit the optimum economic and facility production rates of our industrial suppliers. The net result will be earlier deliveries of these systems at reduced costs. In my view, multi-year procurement should be explored as a means of meeting these objectives.

With this as a background, let us examine the Strategic force picture for the 1980's.

THREAT

Since my last appearance on the Hill, we have observed continued and determined expansion of Soviet military capabilities across the entire spectrum of weapons systems—from general purpose to strategic forces, offensive and defensive alike. Currently, the intelligence community estimates that at least fifty new or modified aircraft, missile, ship and military space systems are in flight tests or sea trials—with a like number in a pre-test stage. The Soviets are allocating money for military research and development (R&D) that equates to outlays twice our own. This indicator is particularly disturbing because it represents an advantage which cannot be quickly or easily overcome.

With this perspective, permit me to review several developments and projections which are of special concern.

On the strategic offensive side, the Soviets have recently completed the deployment of their fourth generation ICBMs—the SS-17, 18 and 19—into increasingly hardened silos. Preparations for the retrofit of earlier models to improve accuracy and increase the number of warheads available for multiple targeting now appear to be underway. They also have fifth generation follow-on systems under development. A medium solid propellant ICBM is expected to come online [deleted.] Advanced liquid fueled ICBMs are also believed to be under development. Maneuverable reentry vehicles can be expected among the improvements on their follow-on systems. The SS-20, the intermediate range ballistic missile

which threatens our allies and our own forces in Europe, has been deployed at the rate of about one launcher per week for the past year and, to date, total deployment exceeds [deleted] launchers.

While continuing production of their Delta III class missile submarine, the Soviets have unveiled the Typhoon, the world's largest submarine. In conjunction, they are testing their first [deleted.] The Typhoon could be operationally deployed by 1985.

Further, the Soviets have not neglected their strategic offensive air force. Deployment of the Backfire bomber continues, and a [deleted] is under development. [Deleted] our belief that a new long-range penetrating bomber, a tanker aircraft, a wide-bodied cruise missile carrier and a new long-range cruise missile are at various stages of development.

Soviet strategic defensive capabilities, already formidable by anyone's standard, will be totally transformed during the 1980's by the introduction of new systems and technologies. In the near term, as the Soviets deploy new and modified interceptors with improved airborne radars, they will achieve a true look-down/shoot-down capability. This will vastly increase their ability to acquire, track and destroy older low-altitude penetrators. The new surface-to-air missile systems now being introduced, such as the SA-X-10 which is especially effective at lower altitudes, coupled with [deleted] early warning and ground control radars, further compound our problem.

Further, by the mid-to-late 1980's, the Soviets are expected to have a capability to extend their air defense coverage [deleted.] Components of a forward defense could include the new [deleted] Airborne Warning and Control System (AWACS) working in conjunction with the modified Foxbat [deleted.] By 1990, the Soviets are projected to have some [deleted] aircraft and about [deleted] interceptors suitable for forward defense. Together, these systems could conduct intercepts [deleted] Soviet borders. If the Soviets elect to devote a higher level of effort to AWACS deployment, they could attain a force level of [deleted] aircraft as early as [deleted] as well as introduce an [deleted] by that date.

This review of strategic defense would not be complete without a few words on their continuing efforts to upgrade their current ABM systems and to develop new ones [deleted]. They have a number of large radars under construction which will greatly improve their warning and battle management capabilities. These activities combined with the continued testing of [deleted] provide clear evidence of a diverse, vigorous and high priority program to develop improved ABM systems. They are also continuing research in several fields such as lasers, particle beam weapons and [deleted] which have wide weapons applications, including both ABM and antisatellite devices.

Finally, this array of offensive and defensive weapon systems is integrated and controlled by a continuously upgraded Soviet command and communications system characterized by a high degree of redundancy. Fixed command centers, backed up by airborne command posts and other mobile centers, are dispersed and hardened at all levels of command. The overall result is growing resiliency and flexibility in force application [deleted]. In short, the Soviets have methodically developed a warfighting capability which can only improve and grow stronger over time.

BALANCE OF POWER IN THE 1980's

An accurate measure of our ability to meet this threat is the strategic nuclear balance of power between the U.S. and USSR. A balance of power, in my view, would deny the Soviets any advantage from initiating a nuclear war and would enhance nuclear deterrence while allowing the U.S. to take conventional action if necessary without the fear of uncontrollable escalation. Such a balance existed in mid-1977; [deleted].

National guidance states that our strategic forces should be structured so that an adversary would not gain any advantage and would suffer unacceptable losses from having initiated an attack. With this in mind, SAC examines the capabilities of our current and planned force structure to identify potential deficiencies. The imbalance I described last year has worsened. The SAC analysis, discussed in Annex A, depicts the static and dynamic measures through each phase of a nuclear conflict.

The charts you see here track our strategic force effectiveness vis-a-vis the Soviet Union throughout the 1977-1990 time frame in terms of residual weapons

and military damage expectancy (MDE) (that is the level of damage we would achieve against fixed Soviet military targets including ICBM silos) following a surprise attack by the Soviet Union and U.S. retaliation. The charts depict changing U.S. capabilities in terms of the increased threat as we viewed it in 1980 and again today. Particularly significant is the greater level of [deleted] in the mid-years—a measure which translates directly into post-exchange power and influence.

The "bathtub" charts to the left display that even with the forces now programmed, we cannot achieve MDE representing a balance of power any time in the [deleted].

[FIGURE 1 deleted]

Note, however, the "bathtub" charts represent only half the picture. We must also look to the charts on the right which depict the residual forces remaining after a nuclear attack and retaliation on military targets to fully realize the impact of the imbalance as it presently exists. In the alert case, Soviet residual weapons that would remain after an attack have [deleted] over last year. This gives them [deleted] the US after the military exchange. Even as we begin to slowly improve MDE through force modernization programs now underway, the Soviet residual force advantage will continue to grow until around 1986, when the MX begins to enter the operational inventory. The residual imbalance will not be completely resolved with currently planned forces even by [deleted]. It is important, therefore, that our existing modernization programs remain on track and on schedule and new initiatives begin.

TRIAD

The Triad is the foundation of our deterrent force—it has stood the test of time and we cannot allow it to falter. A strong effective Triad supports our national objectives in fact and perception by providing a force mix flexible enough to be available when needed . . . enduring enough to see the effort through . . . and capable enough to insure victory. In addition, the Triad concept provides a hedge against Soviet technological breakthrough or a catastrophic failure of any one system or leg by providing time to correct temporary deficiencies or vulnerabilities in an orderly fashion.

Each leg of the Triad contributes unique capabilities and strengths; but more importantly, each complements the others. The following charts depict the contribution each Triad leg makes in achieving MDE and value damage (VD) (that is the percent destruction of the economic data base weighted in terms of value) as well as the total effect of these systems in providing the overall MDE and VD this Command considers necessary to meet defense requirements.

Figure 2 depicts the Triad that provided the VD and MDE representing the balance of power referred to previously.

[FIGURE 2, deleted]

Figure 3 displays our present condition as compared with last year and, shows a continuing decline from a balanced capability. As our ICBM's have become increasingly vulnerable, the SLBM and bombers [deleted].

[FIGURE 3, deleted]

Figure 4 shows the currently planned force structure and depicts the growing vulnerability of our ICBM's as well as the added contribution of the air launched cruise missile (ALCM) and the Trident program. While more hard target kill capability (MDE) is realized, the total contribution is [deleted] a balance of

[FIGURE 4, deleted]

In figure 5, the picture improves considerably over the planned force as shown in the previous chart with the incorporation of SAC's proposal for an interim penetrating bomber (used in combination with ALCM's on B-52's). This mixed force severely stresses enemy air defenses with a corresponding increase in aggregate bomber capabilities.

[FIGURE 5, deleted]

Looking to the 1990 SAC Command Objective Force, Figure 6, we would reestablish a balance of power when MX is deployed in operational numbers

and an interim bomber is fielded. However, without a firm commitment to begin modernizing our bombers, [deleted].

[FIGURE 6, deleted]

FORCE MODERNIZATION

Our modernization efforts focus on maintaining a strong and resilient Triad. Unfortunately, we have allowed concurrent weaknesses to develop with two legs. Our ICBM's are vulnerable and our bombers are old. The result is an adverse tilt in the strategic nuclear balance. Fielding capable systems will require a large capital investment. There is no alternative if we are to improve the situation in both the near and the far term.

ICBM

Modernization of the ICBM leg of the Triad currently depends on the Missile-X, MX, and its basing concept, incorporate the growth, survivability and flexibility requisite for an enduring ICBM component well into the future. Multiple Protective Shelter (MPS) basing will guarantee future adaptability to unpredictable threats and, as a complement, the ability to rapidly reconfigure or reposition the entire force if an attack is imminent—a capability not achievable with silo-based missiles.

Maintaining the initial operational capability (IOC) of MX is critical to our future strategic force posture. In this regard, strong Congressional support will be required to expedite the land withdrawal process—we must be ready to break ground by next January to preclude jeopardizing the 1986 IOC. I fully realize the environmental problems associated with fielding MX. However, in my view, it is a matter of national urgency that MX in the MPS basing mode be kept on schedule. Interruptions or delay in its development and acquisition will leave a void in our strategic capabilities.

BOMBER

The future for penetrating strategic bombers is very much tied to our vision of the strategic force mission—both in a pre-conflict/deterrence role as well as in a warfighting role.

If we are, in fact, serious about warfighting (as a critical underwriting aspect of our overall attitude about deterrence), then there is a real and solid future for penetrating aircraft. I point to our attitude about warfighting capability as key to this question because if we have learned any lesson in history it is that the losers have too often relied on static concepts and "Maginot Line" kinds of military planning.

As I reflect on my own life as a military man, I am struck by the consistent message which fighting commanders echo over and over, "In war, the train moves so fast that our ultimate weapon is having smart people at the right place at the right time." Except on the most technical problems, my own judgment is that it is a mistake to assume that we are smart enough in advance to reckon the outcome ahead of time. In that regard, I believe that the future for manned penetrating systems is secure because I have faith that we will not reject all that our experience and intuition tells us.

From that perspective, I view the immediacy of the Soviet strategic threat and see a near term interim bomber as a mandatory requirement. Similarly, an advanced technology, strategic manned penetrator is requisite if the vitality of the Triad is to be maintained into the 21st century.

SAC analysis indicates that a near term interim bomber is essential. Lacking that bomber, our deterrent capabilities would remain significantly constrained for most of the 1980s. Failure to procure this aircraft, as a stop-gap measure, will be a high risk decision. Two alternatives are presently available—the stretched FB-111 and the B-1.

SAC continues to believe that the FB-111 is the best alternative. However, differences over the specifics of which aircraft should not overshadow the fundamental issue—the need to restore a favorable balance of power as early as possible.

Beyond that, when the near term penetrators are replaced by an Advanced Technology Bomber, they could then transition solely to conventional and theater roles. A follow-on contingency or force projection role for the near term penetrator is a logical extension of its capabilities. One of the strongest attributes of the near term penetrator or any manned penetrating bomber, is the inherent

flexibility of the system. The bomber is multipurpose with the capability to fight across the conflict spectrum. By using the near term penetrator for conventional roles, theater commanders could realize a significant increase in strategic support for theater operations. In addition, crews could be trained and aircraft configured specifically for theater missions, thus decreasing response time.

Operational concepts for the near term penetrator include forward basing to take advantage of rapid deployment, weight of effort, responsiveness to targets of opportunity and tanker independence. The near term penetrator could also perform collateral missions such as aerial minelaying, sea surveillance and reconnaissance, anti-ship and fleet defense.

Either the FB-111 and B-1 can accomplish the missions we will demand of it. The choice should be made in terms of availability, cost and minimum impact on a new technology bomber program.

The new technology aircraft—the so called “stealth bomber”—which uses low radar cross-section (RCS) technology is the most promising aviation advancement in many years and should be fully financed and exploited. The technology is within our current state-of-the-art and, with the promised reduced RCS, penetration remains a viable SIOP tactic.

To calculate the probability to penetrate enemy defenses, one must consider the dynamics of the conflict. It is a complex interaction of tactics involving speed, altitude and timing, electronic countermeasures, damage to defenses, dilution through mass and the RCS of the penetrator. For this reason, we have thoroughly examined the penetration issue using command operational experience and analytical expertise.

The results show that current RCS reduction technologies can noticeably improve bomber penetration. The results also show that with exploitation of new technologies that further reduce RCS, along with the low altitude penetration tactic, bomber penetration of the Soviet Union is achievable into the next century.

It is important to sustain our commitment to the Advanced Technology Bomber, as the penetrator for the future. In my view, we cannot afford to have this program canceled or delayed now or as it approaches operational service.

TANKERS

Current air refueling assets are insufficient to carry out even our most fundamental tasks. Virtually every combat aircraft and most mobility aircraft are now air refuelable. A requirement to provide simultaneous tanker support for strategic SIOP forces and conventional forces will stress our current assets.

In the SIOP, tanker requirements have increased for a variety of reasons: national policy decisions requiring greater targeting flexibility; the loss of forward bomber basing; numerous modifications to the B-52 over the last 20-25 years which have increased aircraft weight and drag and more extensive use of low level tactics. [Deleted.] This, in turn, reduces the probability of mission success and diminishes our ability to recover and reconstitute the bombers for second strike. To offset these degradations, [deleted] additional tankers are needed today.

By the mid-1980's, B-52's will become even more dependent on aerial refueling as the Air Launched Cruise Missile (ALCM) is employed on the B-52G. The combination of increased drag due to external ALCM carriage and internal fuel reductions to offset missile weight will decrease aircraft range considerably. Over [deleted] additional tankers will be required just to support the B-52G/ALCM force.

Additive to this SIOP shortfall is the increasing demand for aerial refueling of strategic airlift and tactical fighter/reconnaissance forces. Every major operations plan for U.S. force projection includes aerial refueling as an integral part of its application. It is likely that developing contingencies would result in an advanced defense posture requiring full generation of the bomber force, with concurrent support to the theater and conventional forces. For example, SIOP generation plus a rapid reinforcement of NATO allies requires approximately [deleted] aircraft in 1986. The cumulative 1983-1990 requirement to execute simultaneously all combat plans approaches [deleted]. In such a situation, we would simply find our aerial refueling capability overtaxed.

Compounding this problem has been the gradual reduction in overseas operating locations (from about 70 in 1968 to less than 30 today) and more stringent host-nation restrictions involving enroute staging and overflight rights. Recent

Middle East/Southwest Asia events show that we are clearly dependent upon aerial refueling for the deployment and employment of tactical forces. The addition of the C-141B, the Rapid Deployment Force and the C-X will continue to exacerbate the tanker problem.

The opportunity to modernize our air refueling capability is available through continued acquisition of the KC-10 and implementation of the KC-135 reengine (KC-135R) program. The KC-10 adds a much needed long range capability while the KC-135 reengine program resolves deficiencies of the current KC-135 engine.

KC-135 reengining increases fuel offload capability by almost 50 percent, nearly doubles its effective range, and improves takeoff performance. Air Force studies have shown that over a 20-year period, due to cost avoidance, a production rate of six per month and operating efficiencies, it is actually cheaper to reengine the entire KC-135 fleet (a gain of approximately 300 KC-135A equivalents) than to maintain our current fleet.

Both the KC-135 reengining and KC-10 programs offer an excellent opportunity to optimize production and save tax dollars while offsetting the tanker deficiency. We can begin with FY 82 funds to program an economical KC-135 reengining program and to recover the remaining economies available in an accelerated KC-10 production contract.

I strongly urge your support for these complementary tanker initiatives. We need both to provide the capability required in the years ahead.

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE (C³I)

This year I want to emphasize strategic connectivity because I am convinced that C³I is the glue which binds our warfighting capability together.

Strategic connectivity that provides the National Command Authorities (NCA) with a closed-loop capability to manage forces throughout a conflict is mandatory. To do this, the C³I network must be: survivable . . . enduring . . . and two-way. Warning, intelligence and force status information must be continuously provided to the nuclear commanders and the NCA—and the decisions of the NCA must then be communicated down the chain to the forces in the field. This is what effective force management and escalation control are all about.

Today, national policy for the prosecution of nuclear war differs from that of a generation ago. National guidance now requires the capability for a more measured and flexible use of forces throughout the spectrum of strategic nuclear operations. When the United States enjoyed clear-cut nuclear superiority over the Soviet Union, emphasis in the communications area was concentrated on force execution . . . with little concern for what would be required to support escalation control or follow-on force management. But, as the strategic equation has shifted over the years, there has been a corresponding move toward providing the NCA with greater flexibility and additional nuclear response options. This has significantly increased the need for more and better tools to support improved force command and control.

I have initiated two actions which have helped define this serious connectivity problem. Over two years ago, the JCS Connectivity Study pointed out the fragile nature of the current system and recommended near-term actions to correct some of our current deficiencies. Those recommendations, for the most part, centered on improving the present C³I network with procedural changes and off-the-shelf equipment.

One of the more significant early outcomes of the study was the creation of a new Joint Chiefs of Staff agency called the Joint Strategic Connectivity Staff (JSCS). Their charter is to analyze strategic connectivity systems and procedures and to recommend to the Joint Chiefs ways to improve both offensive and defensive C³I capabilities in view of the Soviet threat.

Our military structure is connected by a network of automated C³I systems. They are essentially soft, fragile peacetime systems, conceived in the late 1950's and put into operation in the 1960's. Most are located at fixed sites or depend on ground communications networks and, like all terrestrial sites, are highly vulnerable to attack and destruction.

The fragile nature of our current system is highlighted by the high stress placed on our C³I system by Soviet submarines which patrol off both of our coasts. The submarines, because of their close proximity to Washington and coastal military installations, greatly decrease the amount of warning and decision time available. Here, we are talking about minutes . . . a very few minutes . . . dur-

ing which the NCA must make national decisions of the greatest possible importance. In the space of no more than [deleted] attack assessment information must be weighed, possible response options discussed and the correct decision made. Even after a decision is reached, the information must still be formatted and disseminated to the forces in the field.

Today, communications from the NCA essentially are only capable of enabling execution in an undamaged mode. [Deleted.]

The results of the connectivity study and the efforts to date by the JSCS have convinced me that [deleted]. Given present state-of-the-art technology, and that projected for the next five to ten years, the only way to ensure survivable and enduring strategic connectivity in the 1980s, in my view, is to increase our reliance on mobile and space-based systems and to upgrade aging systems.

This approach will involve changes in warning sensors, as well as the National Airborne Command Post (NEACP) and the Unified and Specified Command airborne and fixed command posts—both at headquarters and unit level. Ultimately, we must achieve the ability to connect all of these together independent of fixed ground relay stations.

SAC has begun some initiatives in this regard. For example, to insure positive dissemination of Emergency Action Messages, we are now replacing the SAC Communications System (SACCS) with an upgraded digital network (SACDIN). We have also proposed the acceleration of our airborne command posts program, with its related airborne data processing equipment and mobile ground entry points, to ensure the survivability and endurance of command elements.

We are now in the process of deploying the Worldwide Air Force Satellite Communications (AFSATCOM) network to serve the NCA, the JCS, unified and specified commanders, and worldwide forces. Even with full deployment in 1983, we still will not have a completely survivable communications network. AFSATCOM space vehicles and airborne terminals are hardened to electromagnetic pulse (EMP) and have a modest anti-jam capability, [deleted]. To correct these deficiencies, SAC is urging the earliest possible deployment of a survivable military satellite communications systems as the best long term solution for insuring two-way connectivity from the NCA to the forces.

SAC is also concerned about the capability to detect and assess an ICBM, SLBM or atmospheric attack. Warning information is critical to our survival. It must be detailed, unambiguous and timely. System reliability and credibility must be such that decision-makers are confident of its accuracy. Today, we have [deleted] in the coverage of potential [deleted]. Neither the terrestrial nor space-based segment fulfills our need for [deleted] on which to base an appropriate, deliberate response. Additional ground-based radar sites, called PAVE PAWS, with power upgrades [deleted].

In order to assure receipt of infra-red sensor warning information, SAC supports the addition of mobile ground terminals as an interim solution for providing communications and processing capability. However, we need to apply more resources toward achieving the capability to transmit sensor data direct to surviving command elements. Modern sensor technology, optical crosslinks and onboard processing have the potential for providing that information and bypassing ground relay or processing stations.

As I weigh the evidence, I must conclude that, today [deleted]. Many programs are needed to get well—I have highlighted but a few which in my opinion are of paramount importance. These systems are specifically designed to provide the President with a survivable means to confer with his nuclear commanders and to execute, control and terminate strategic conflict anywhere in the world. Strategic C³I has not received cohesive management attention nor the funding support commensurate with the job it has been asked to do. This deficiency is a direct threat to the effective employment of our strategic forces.

OPERATIONS AND MAINTENANCE

In recent years, the Operations and Maintenance (O&M) appropriation has been seriously underfunded. Coupled with inflation and the relative inflexibility of O&M costs (80-85 percent of O&M expenses are fixed), SAC is compelled to meet operational requirements while paying ever-increasing bills in relatively fixed cost areas such as civilian pay, fuels, utilities and contractual services. Far too often, such underfunding has forced the military leadership to "rob Peter to pay Paul" in an attempt to continue essential operations. In fiscal year 1981, the fuel price increase alone will cost SAC more than \$48 million, and

this figure excludes aviation fuels which are centrally funded from Washington.

Since the Command cannot cover such shortfalls, supplemental funding becomes essential to maintaining readiness and training. As in prior years, we are again forced to defer critical maintenance and repair of runways, buildings and other facilities and to reduce funding in support areas that have the least immediate impact on the mission. The national experience with inflation clearly demonstrates that "paying more later" is uncertain economy at best.

The Congress is to be commended for recent efforts to better understand the O&M impact on readiness and our overall operations. By reviewing O&M, both in the authorization and appropriation processes, a greater understanding of the importance of O&M to force readiness can be gained. However, we recommend flexibility be retained by minimizing the "fenced" funds so that our commanders can effectively manage their day-to-day operations.

PEOPLE

Our strategic force posture is dependent upon retaining and recruiting quality personnel. Today, we are undermanned in both quality and quantity. Especially critical is the level of manning in supervisory positions. Mid-level enlisted supervisory manning in maintenance skills is under 85 percent. We project a flying officer shortfall of nearly 300 this year. As a result, we are maintaining full crew manning at the expense of rated staff supervisors. Consequently, our mid-level field grade officer manning is reduced to 80 percent—only 70 percent in important maintenance and support areas.

These shortages, and the very real impact they have on combat capability, are a function of our inability to retain vital personnel resources. Last year, SAC retained only 31 percent of its first term enlisted people. A little over half of our second-termers reenlisted and 73 percent of our people left the service after 20 years but prior to their mandatory retirement date. Specifically, less than one percent of our aircraft mechanics stay beyond 20 years.

During fiscal year 1980, the continuation rate for pilots in the 6-11 year group was 42 percent; the navigator and support officer rate was under 57 percent. The numbers for engineers and scientific field officers were even less.

Compounding the retention problem is a declining recruiting environment. Population projections reflect a decreasing pool of youth available for military service beginning today and continuing beyond the year 2000. The quality of potential recruits is particularly worrisome. Over the last four years, there has been a 20 percent reduction in Air Force recruits in the higher mental categories.

The net effect is that we are losing skilled, trained and experienced personnel—the mainstays of our strategic capability. These losses cannot be replaced except through training and seasoning new recruits which carry a large price tag in time as well as dollars.

While statistics for the beginning of fiscal year 1981 show signs of improvement in both retention and recruiting, the specific reasons for these improvements are yet unclear. The existing "downturn" in the economy and the resultant lack of alternate job opportunities is certainly a factor. Recent legislation indicating possible improvements in the quality of life is also a potentially positive influence.

We need to commit funds, not to replacement training, but rather to provide necessary retention incentives. Despite a few signs of improvement and the possible reasons for them, it is important that we receive continued support from Congress. The October pay raise of 11.7 percent, along with the increased benefits provided by the Nunn Warner Amendment and Fair Benefits Package, is a start toward helping to restore the military to a more reasonable and respected position within our society.

More needs to be done, however, particularly for our young airmen. They continue to experience what the financial experts call a "cash flow" problem. The magnitude of this very real problem can be seen at each commissary in the Air Force. In 1980, over \$2.3 million worth of food stamps were redeemed at SAC commissaries alone. Although the rate of increase of food stamp redemptions compared to 1979 has decreased since the last pay raise, total redemptions double. If we are to build the force properly, one food stamp redeemed by our people is one too many.

Other areas also require attention: The GI educational bill, adequate hospital care for families, increased CHAMPUS coverage, and special pay incen-

tives. Only through active, well-coordinated, properly directed programs will we be able to stem the tide of departures by people from critical career fields.

ROLE OF CONVENTIONAL FORCES

For many years, the United States has concentrated on strengthening its military readiness in Western Europe and the Pacific. We maintain forces in both areas as a constant reminder that we are determined to stand by our friends and protect mutual national interests.

However, during the last two years, events in the Middle East have clearly demonstrated that a new military force is required—we need a force that can deploy on short notice, move to relatively unprepared bases and fight if called upon without support from friendly allies. The concept of the Rapid Deployment Force (RDF) grew from this requirement.

SAC possesses long range bomber, tanker and reconnaissance aircraft. Recognizing this unique capability, we developed a self-contained unit called the Strategic Projection Force (SPF)—presently the only unit capable of rapid deployment. The 57th Air Division located at Minot Air Force Base, North Dakota, has the responsibility to organize and train this force.

The demands are tough. These units must be able to deploy anywhere in the world within 24 hours, thus providing the RDF a badly needed response capability. Arriving at a forward air base, the SPF can be ready to fly missions within [deleted]. Aircrews and support people are now being trained to meet this requirement, although deployable supply kits and reserve depot stock are limited.

The first large-scale field exercise for the SPF was conducted during the last week of September. Nicknamed Busy Prairie, it was a live demonstration of an existing capability. Busy Prairie clearly showed that the SPF has come of age—grown from a concept to a force-in-being of significant military and diplomatic potential.

The need for [deleted] area must be addressed if the full potential for the RDF with the SPF is to be developed. Currently, [deleted] appears to be the [deleted] such as [deleted] are essential if the U.S. is to project its presence into the Middle East or Persian Gulf. I urge this Committee to support the funding necessary to expand this RDF capability through resources currently requested.

CONCLUSION

We share a mutual interest and fundamental responsibility—our Nation's security—today and for the future. Let there be no doubt as to our required course. The time for further study . . . delay . . . and debate is past. The time for decision is now.

Force modernization, necessary to redress the present imbalance, will not come cheaply—but, it is squarely in the national interest that it come first. Acceptance of the present imbalance—threatens the credibility of the U.S. nuclear deterrent—subjects the free world to Soviet intimidation and coercion—and increases the possibility of a major power confrontation.

We have a consensus that there is a strategic nuclear imbalance. We now need a consensus on how to facilitate the redress of that imbalance. Thank you.

ANNEX A

COMPARATIVE STRATEGIC FORCE ANALYSIS

The following charts are a summary of a great many computer runs, using a highly sophisticated model, to analyze the interactions between U.S. and Soviet strategic nuclear forces now and in the future. Such analytical techniques are necessary tools for the military planner.

The departure point is national guidance as amplified at the Secretary of Defense and Joint Chiefs of Staff levels. Mid-1977 national guidance stated that rough strategic nuclear equivalence existed at that time. Our analysis indicates that the mid-1977 position did, in fact, represent a favorable balance of power for the U.S.

Because the product of our computer modeling is only as objective as the input, we limited our inputs to: agreed upon national intelligence estimates, the RISOP-SIOP target data bases, JCS approved force capabilities and force laydown principles as established in the Joint Strategic Target Planning Staff. In addition, our mathematical models and data base are accepted as soundly conceived

and properly executed by responsible analytical agencies in OSD, the Joint Staff and the Air Staff.

Figure 1 depicts the mid-1977 balance of power. It displays the executed results of projected nuclear exchanges should the Soviet Union launch a surprise attack against the U.S. and we retaliate from a day-to-day alert posture. The alert scenario was chosen as most representative and shows those forces on normal day-to-day alert that would respond to a first strike attack. These include approximately [deleted] percent of the bombers, [deleted] percent of the intercontinental ballistic missiles (ICBM) and [deleted] percent of the sea-launched ballistic missiles (SLBM).

Our analysis begins with the gross numbers of static measures available to each side, labeled "on-line available," from which the alert numbers used for the remainder of the computations are derived.¹ Next, three phases of nuclear war are examined in detail: pre-hostilities, post-military attack (counterforce), and post-military and economic attack (counterforce/countervalue). These three phases are necessary to show a comprehensive picture of the balance of power since no single indicator can tell the complete story. Indeed, one indicator could be misleading when displayed alone.

[Deleted.]

The pre-hostilities phase represents the day-to-day status of forces and measures four static indicators. The first is weapons (WPNS), the number of warheads/bombs loaded on alert delivery vehicles. The next column, megatonnage (MTS), is a measure of the gross destructive power possessed by those weapons. Equivalent megatonnage (EMT), column three, measures destructive potential against economic and soft military targets. Perhaps the most telling measure of war fighting capability is shown in column four—countermilitary potential (CMP). This measure of merit depicts destructive potential against hardened, dispersed targets—most of which include offensive weapons that can inflict direct damage on each homeland. The U.S. has not sought to match the Soviet Union in all of these areas because pre-hostility static measures, while important in terms of perceptions, may or may not be indicative of the war fighting capability of a force.

Having established the alert pre-hostilities condition, we analytically engage the forces on a counterforce or counterforce/countervalue nuclear exchange and measure the surviving static indicators as well as the amount of damage incurred by both sides. The remaining war fighting capability of each combatant is then determined by the relationship between the dynamic measures expressed in damage expectancy (the two columns on the right) and the residual static measures (the bars on the left).

As you can see, [deleted].

As we project the Soviet threat through the 1980s and perform the same type of analysis with respect to our programmed strategic force, we see a very different picture evolving. Three representative years have been selected to illustrate this evolution: 1981 shows current capabilities; 1986 depicts the magnitude of the Soviet threat before U.S. strategic force improvements come on-line in significant operational numbers (especially the MX); and 1990 shows our end-of-decade position following completion of our currently programmed modernization efforts.

[FIGURE 2, deleted]

Compared to 1980, the Soviet capabilities in 1981 (Figure 2) have shown an increase in practically all measures. Of particular importance is the [deleted]. Further, Soviet residual warfighting capability in 1981 has [deleted].

[FIGURE 3, deleted.]

By 1986 (Figure 3), U.S. modernization programs—Trident and ALCM—have started to reverse the imbalance. Still, the [deleted]. The Soviets continue to increase the quality of their weapons stockpile, [deleted].

[FIGURE 4, deleted.]

In 1990 (Figure 4), U.S. military damage expectancy against the Soviet Union has [deleted] with the deployment of MX, ALCM and Trident. Nonetheless, the

¹ On-line available represents those weapons (and associated measures) which a commander would have operationally ready to commit to war.

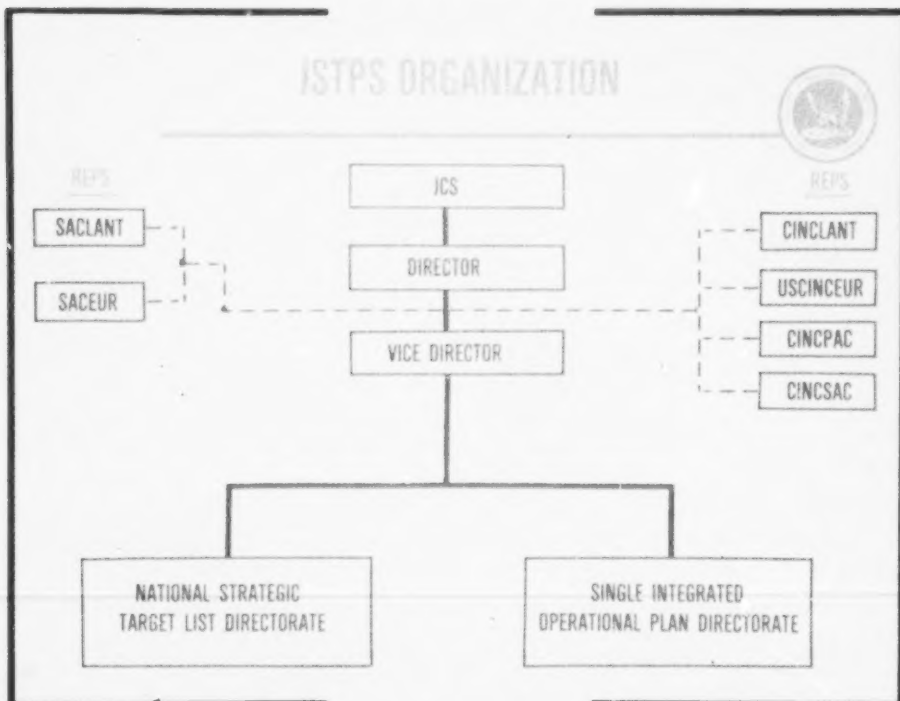
[deleted]. The number of Soviet residuals [deleted], however, the trend toward a higher quality stockpile continues.

Senator WARNER. We will proceed now to Admiral Carr.

STATEMENT OF VICE ADM. KENNETH M. CARR, USN, VICE DIRECTOR, STRATEGIC TARGET PLANNING, JOINT STRATEGIC TARGET PLANNING STAFF

Admiral CARR. Mr. Chairman, Senator Goldwater, this short briefing discusses the mission of the Joint Strategic Target Planning Staff in developing the single, integrated operational plan, or SIOP, U.S. nuclear war plan.

[The chart follows:]



General Ellis, Commander in Chief, Strategic Air Command, is assigned responsibility as director of strategic target planning. As such, he is responsible for the construction of the SIOP. I assist in this responsibility as his vice director.

We have a staff of over 300 personnel.

National policy for this employment of nuclear weapons is defined in broad terms by the President. The Secretary of Defense must furnish further interpretation of Presidential guidance; and based upon these documents, the Joint Chiefs of Staff provide detailed guidance for the Joint Strategic Target Planning Staff.

DETERRENCE OF NUCLEAR ATTACKS

The principal objective of current national policy is deterrence of nuclear attacks against the United States or its allies. Maintaining a strong national defense and projecting a will to use military force if deemed necessary meets this objective. [Deleted.]

There are four targeting objectives outlined in the guidance for development of the SIOP:

The first objective is to [deleted]. Shown here is the numerical summary of a number of installations that fall into this category and typical examples of installations that make up the recovery objective.

This map gives an idea of the location and distribution of recovery resource installations.

The second objective addresses the [deleted].

The third objective against [deleted].

Senator WARNER. Excuse me, Admiral.

While we have that preceding chart up, could you show me the basic dispersal of those [deleted] systems?

Admiral CARR. Yes, sir. You can see the aggregation of dots around. Those are generally the [deleted].

Senator WARNER. They are [deleted] are they not?

General ELLIS. They are generally dispersed [deleted] Mr. Chairman.

Senator WARNER. Could you give me some rough comparisons with our sites in Wyoming and the Dakotas?

General ELLIS. We have sites based in 11 different States. Minuteman missiles are, for the most part, in the upper Northwest and Central United States, with a single exception of Missouri, and the Titan is in Kansas, Arkansas, and Arizona.

Senator WARNER. I remember the map you showed me when I visited last weekend, but I was not able to compare it with this.

Is this dispersion pattern wider than what we have here in this country?

General ELLIS. Yes. It does not show up as well on this map on the one you saw at Offutt, Mr. Chairman, but the dispersion is generally [deleted].

[Additional information follows:]

ICBM DISPERSAL

Mr. Chairman, let me add some specific information with respect to dispersal. Sites within U.S. ICBM fields are [deleted] Soviet ICBM fields.

[Deleted.]

The Soviets have 1,398 silos organized in [deleted].

Senator WARNER. Thank you very much.

Admiral CARR. The final objective is to [deleted] his overall military capability and deny him access to external resources.

As shown on the map, most of these installations [deleted].

To plan the SIOP, JSTPS uses the nuclear capable forces committed to SIOP by the major nuclear commanders as shown by the green arrows. In addition, the JSTPS is charged with coordinating the nuclear war plan of Allied Command Europe with the SIOP as indicated by the yellow arrow.

Shown here by strategic weapon system across the top, and force posture on the left, are the weapons committed to the SIOP by the major nuclear commanders.

Senator GOLDWATER. Your total forces, bombers, do they include [deleted].

Admiral CARR. Those are the total forces committed to the JSTPS.

Senator JACKSON. Are those warheads?

General ELLIS. That includes the SRAM and gravity bombs that each of those bombers carry.

Admiral CARR. This chart shows characteristics of the three submarine-launched ballistic missile system currently planned in the SIOP. The number of reentry vehicles' range, yield and accuracy (circular error probable) are shown for each weapon system.

Here in the same format are the various characteristics for the ICBM force. Minuteman II and Titan deliver one warhead each. Some Minuteman III missiles are being configured with the Mk 12A warhead to increase the yield from [deleted].

Shown here are the characteristics of the SIOP bomber force. The B-52 in its SIOP role normally carries [deleted]. The FB-111 carries [deleted]. These strategic weapons provide our capability to meet the objectives of the major SIOP options.

In summary, the Joint Strategic Target Planning Staff is a planning staff of the Joint Chiefs of Staff that coordinates the use of strategic nuclear weapons. These forces are committed to the SIOP by the nuclear commanders.

JCS provides planning guidance to the JSTPS. JSTPS transforms this guidance into the attack options included with the attack structure, analyzes the plan and reports the results to the JCS.

Coupled with our strategic force capability and perceived will to use it, the SIOP provides a strong basis for deterrence.

This concludes the briefing.

Senator WARNER. Thank you very much.

Senator Jackson?

Senator JACKSON. Mr. Chairman, I just have some general questions. First, what can we do with the existing delivery systems to make them more secure or to harden them thus complicating the enemy's ability to knock them out. As I see it, we have this period of greater danger in terms of not just a military attack but a great political risk, such as a political move, that the Soviets might make in which we would have to back down or they would assume we have to back down.

I do not think they want to make a surprise nuclear attack. I do not think that is their game. What is it that is going to convince them in the immediate future, the next 4 to 5 years, that is going to really deter them?

General ELLIS. Senator Jackson, with regard to each of the three missile systems, the ICBM force today maintains a [deleted] percent plus alert rate at all times. It is at the highest state of readiness that it can be.

Senator JACKSON. That is Minuteman?

General ELLIS. Minuteman and Titan, yes, sir.

FORCE ON CONSTANT ALERT

With regard to the bomber force, we keep approximately [deleted] percent of the bombers and supporting tankers—roughly [deleted] aircraft—on constant alert. They are at the appropriate alert levels, so that they could escape prior to the impact of SLBM weapons.

If we suffer a strike out of the blue, a surprise attack, we accept the probability that the other 70 percent of the force would be destroyed. About the only thing we can do about that is to increase the alert level.

Originally SAC maintained 50 percent of that force on day-to-day alert. Over the years we have decreased the number of crews and have decreased the number of maintenance personnel. To return to higher alert rates will require 2 to 4 years, and I must say that there is disagreement as to specific timing, in order to provide the necessary trained people.

Senator JACKSON. You have a leadtime problem in training personnel?

General ELLIS. Yes, sir. We would also need to take a hard look at alert facilities and ramp space as well as whether we have the equipment in terms of numbers of aircraft to provide the required upgrade training. In the old days when we had 50 percent on alert, we had a much larger bomber force and more flexibility in scheduling our aircraft.

With regard to the submarine force, approximately [deleted] percent of that force is at sea at any one time and survivable. We could increase the alert rates, but I think Admiral Carr could probably speak to that better than I. Again I would assume that the Navy has the same lead time problems in terms of training crews and acquiring parts.

Do you want to add to that?

Admiral CARR. No, sir.

CRUISE MISSILES

General ELLIS. Additionally, Senator, our air-launched cruise missiles, or ALCMs, start coming on line this year with our first full operational squadron by December 1982. By 1987 the entire B-52G force will be equipped with the ALCM carried on the wings—that is 12 ALCM on each of about 170 B-52G's. We will then commence retrofitting them to carry the ALCM in the bomb bay. We have also recommended, and there has not been a final decision on this, that the B-52H convert to ALCM, we hope to an advanced ALCM.

We think that through the later part of the 1980's, penetrating with a B-52 will be extremely difficult. We have recommended an interim bomber. Depending on which candidate aircraft is chosen, the first squadron will be operational either in 1985 or for its competitor, in 1986.

Senator JACKSON. I guess the question I want to ask is would it be wise to step up the production of ALCM, GLCM's and SLCM's dur-

ing this immediate period? I supported in the 1950's, late 1950's, the production of the B-52 while others said that because we have Atlas coming on and later Minuteman, that we don't need a bomber. I supported the B-52 basically for historical reasons, that the Soviets do respond in terms of meeting a challenge with a defense system. We know that they have spent about \$100 billion in building an air defense system which diverted their resources. That is one contribution that the bomber force has made. Would you agree?

General ELLIS. Yes.

SOVIET RESPONSE TO MISSILE OUTPUT

Senator JACKSON. The general question I raise is what is their response going to be to a substantial output of cruise missiles?

During the 1980's they will have trouble coming up with a system that can meet it defensively. Do you see any merit in that strategy especially in light of the fact that they have deployed of course the SS-20? Our role will be a second strike system during this period. I am not excluding MX but that is down the road. Our response to this monstrous buildup of the SS-20 would be a second strike system which we could deploy overseas as part of the void that we face here or deficit that we face in the 1980's. I am wondering what you feel the Soviet view of that would be?

I mean from a military point of view and that they might do about it?

General ELLIS. Let me first address the weapons that will be based in Europe, the GLCM and the Pershing II. I strongly support the deployment of that force. I believe that force causes the Soviets a great deal of trouble and concern. Those weapons provide an offensive capability against the Soviet Union that they cannot duplicate. By that I mean, we would be able to strike the Russian homeland, the capital, with weapons based in Europe, which we cannot do now, whereas they cannot reach the United States with their SS-20 or other theater-type missiles.

Senator JACKSON. They can put another stage on, of course.

General ELLIS. They can, or they can [deleted] of the United States with [deleted]. We have seen no indication that they intend to do that.

With regard to the ALCM, we believe it is possible to increase the production rate. At the same time, however, we would have to pull additional B-52's out of the force, further reducing the present force capability in order to convert them.

With regard to how the Soviets will react to that, obviously the possibility of several hundreds and perhaps thousands of air-launched cruise missiles penetrating their homeland at one time is an impossible situation. [Deleted.] They are [deleted] into development of their AWAC's system. At the same time, they have [deleted] fighters [deleted] and in development with advanced look-down shoot-down capabilities.

Obviously it is much more practical to try to intercept the carrier with 20 ALCM aboard than to attempt to defend against them individually as they penetrate their homeland.

Senator WARNER. Would the Senator yield?

Senator JACKSON. Yes.

Senator WARNER. As I understand, the question is what the witness recommendation is with respect to the acceleration of the program. I refer to page 2 of your opening statement, General Ellis, in which you stated rather succinctly:

For the past 4 years it has been suggested that the high technology air-launched cruise missile (ALCM) in and of itself could serve to adequately maintain the effectiveness of the air-breathing leg of the Triad. I do not agree. Although the ALCM will be a valuable supplement to the bomber, it is only a weapon, not a central weapon system. It cannot duplicate the many advantages inherent in the manned penetrating system developed and refined over the last 40 years.

That would appear to me that you think it is just a supplementary system and therefore perhaps added emphasis should not be placed on it. I interpreted Senator Jackson's question, acceleration of the program, to indicate perhaps added emphasis should be placed on this weapon.

General ELLIS. I was responding to the question which asked, as you stated, what could we do. I was enumerating what we could do. We have not recommended that we increase the ALCM production program beyond our current proposal. That is to convert the entire B-52G force and then in 1985 to start converting the B-52H force. When this conversion is completed by 1990, it will give us some 5,000 ALCM's.

Senator JACKSON. ALCM has of course a capability to the extent that we have the aircraft to launch it from. I was also including GLCM, the ground launched system, to complicate their problems, especially in Europe, specifically where we can deploy these systems. Of course, there is a big political problem and it has to be resolved—I am not getting into that at the moment. We might phase out some of the fighter bases which are all obviously soft targets at the moment for the Soviets.

But with GLCM's being placed in camouflaged positions, not knowing where they are, this really complicates their offense in Europe and it gets at the homeland of the Soviet Union. I am only looking at cruise missiles in this interregnum in which we find ourselves where the MX is not going to be available soon enough. We do not have a survivable ballistic missile system to count on at present. So we are stuck with air breathers, the cruise missile. But it seems to me that there is an opportunity here to complicate the Russian problem. The Russians are pretty conservative about any move they may make strategically and otherwise. I am looking at it primarily from the standpoint of complicating their problem of air defense and how they would respond to it, which would divert resources, which would force them to do a lot of things that they would not do otherwise.

There is no other way that you can fill this gap in say 1980 to 1985, is there, General?

General ELLIS. For the mid-1980's, we can start with an interim bomber.

Senator JACKSON. We don't have it?

General ELLIS. That is correct.

Senator JACKSON. I am not precluding all other things. I am asking what can you do the fastest to complicate their problem? That is my pitch. Historically the Russians are extremely responsive to a system for which they have no defense. Therefore, they start plowing their

resources into that area and that fact has been true back to Czarist times. I am trying to think in those terms about what we can do in this interregnum where we find ourselves without an ability to deal with it.

Now you have the SALT II Protocol which expires in 1981. We got into this idiotic position where they can have the SS-20 but we can have cruise missiles only up to 600 kilometers or 375 statute miles, which is ridiculous. There they are sitting with the SS-20 which does not count under SALT II and our response can be an entirely, not provocative but defensive in that the cruise is a second strike weapon system. I think it will drive them right up the wall in terms of how they are going to deal with this problem.

I am sorry, I have gone over my time.

Senator WARNER. Would the witnesses care to respond?

General ELLIS. As I said, Senator Jackson, I agree with the placement in Europe of the GLCM and the Pershing II. I would like to provide the precise dates for the record but if my memory is correct, these [deleted].

Senator JACKSON. Productionwise?

General ELLIS. Productionwise.

Senator JACKSON. In aircraft we are limited. We have to have so many on alert. I understand that. But on GLCM, this is ground launched.

General ELLIS. I will have to provide that for the record, sir. I do not have those dates.

[The information follows:]

ALCM PRODUCTION

General ELLIS. Senator Jackson, the ALCM production rate can be increased to 60 per month by 1984. The accompanying costs and schedule assume a start by June 1981. The total cost of the ALCM with the B-52G and H modification accelerations and the increased number of ALCM's required to equip B-52H's is \$4.55 billion above the fiscal year 1982 budget. This plan would give the B-52G and B-52H a full standoff capability (20 missiles per aircraft) in fiscal year 1989 and final deliveries of spares in fiscal year 1990.

I have asked the Air Force Staff to respond to the GLCM and SLCM portion of the question since the information is not available at SAC.

COSTS AND SCHEDULES ASSOCIATED WITH ALCM ACCELERATION

	Buy schedule												Total
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
B-52G:													
External		3	22	40	40	41	26						172
Internal				1	20	38	40	33					172
B-52H: External/internal							3	23	22	26			96
Cumulative ALCM deliveries			21	319	799	1,469	2,189	2,909	3,629	4,349	5,069	5,369	
	Cost (TV, in millions of dollars)												Total
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988/TC			
B-52G, 3010/3400 mods			+50	+150	+100	+50		-50	-100	-100			+100
B-52H, 3010/3400 mods						+50	+200	+175	+175	+150			+750
Total, additional funds for B-52 required			+50	+150	+100	+100	+200	+125	+75	+50			+850
Additional ALCM funds required			+30	+340	+380	+410	+430	+450	-460	+1,200			+3,700
Total, additional funds required			+80	+490	+480	+510	+630	+575	+535	+1,250			+4,550

GLCM/PERSHING II DATES

The first IOC of GLCM occurs in the United Kingdom in December 1983. This coincides with the IOC of Pershing II in the Federal Republic of Germany which is also December 1983. The GLCM IOC date in [deleted.]

Senator WARNER. Senator Goldwater?

Senator GOLDWATER. On page 9 you say:

I recommend creation of a national security communications organization with the authority to pull together the military C³ network throughout the executive branch. Such an organization could implement the spirit, as well as the letter, of PD-59.

You undoubtedly have given this quite a bit of thought. I wonder if you can supply the committee with a suggested organizational structure of such an organization so that we might consider it during our hearings?

General ELLIS. I will be delighted to, Senator Goldwater. I am scheduled to appear before this subcommittee on the subject of Command and Control next month. I will provide our thoughts at that time.

I should like to emphasize one important point, Senator Goldwater. I am talking about the military aspects of Command and Control—from the White House on down to the forces in the field.

Senator GOLDWATER. I understand that but it would help us a lot if we understood what your concept of the organizational chart would be and where it fits into the entire structure.

General ELLIS. I could give you the general details and I will do that at those hearings. My thought is that we establish at the Secretary of Defense level an office reporting directly to him in which all of the responsibilities reside. I recognize we are building a bureaucracy in OSD, but I believe the different aspects of Command and Control are splintered among several assistant secretaries at the DOD level. There is no coherence in their budget. The services do not support it because it is not a plane or a tank or a ship. It is going to have to be focused at the very highest level with perhaps funds that are dispensed to a certain degree.

Senator GOLDWATER. Admiral Carr, what is the average Soviet yield for their MIRV's?

Admiral CARR. I will have to provide you the exact numbers, but their yields are [deleted.]

[The information follows:]

ICBM YIELD

Senator Goldwater, our intelligence estimates the average yield of Soviet MIRVed ICBMs is [deleted.] The lowest yield is [deleted.]

The average yield of U.S. MIRVed ICBM's is [deleted]. The lowest yield being [deleted].

There is an advantage to larger yield, if we assume other weapon characteristics such as prelaunch survivability, number of RVs, range, weapon system reliability, delivery accuracy, and height of burst options are equal. A larger yield increases probability of damage to targeted installations. This increase is greatest against hard installations. Larger yields also permit destruction of a larger number of installations with each weapon. This advantage would allow destruction of major target complexes with fewer weapons and thereby free weapons to strike other critical objectives that would be untargeted otherwise.

Senator GOLDWATER. Do you honestly feel that the [deleted].

Admiral CARR. I would prefer to be at least in the [deleted].

Senator GOLDWATER. That is all I have, Mr. Chairman. Thank you.
 Senator WARNER. Senator Nunn?

The Chair intends to remain this morning well into the hearing time. Therefore I will defer to other members for purposes of questions.

Senator NUNN. Thank you, Mr. Chairman.

General Ellis and Admiral Carr, I am delighted to have you here this morning. I just have a couple of questions.

One is what were the features of SALT II, if any, that would have been strategically helpful had SALT II gone into effect in terms of the overall balance as you have described it in the next several years? The second part of the question is: What features of arms control should we be most concerned about and give priority to if and when we enter into SALT II and a half negotiations or SALT III negotiations that would help alleviate some of the strategic balance problem that you have outlined?

General ELLIS. The key advantage, Senator Nunn, that I saw in SALT II, without considering weaknesses and that sort of thing—

Senator NUNN. That is right. I am not trying to get the overall picture.

General ELLIS [continuing]. Was the limitation in numbers of missiles by type. The number obviously is not low enough, but it is fixed at this point both in ICBM's and in SLBM's. They have two and perhaps three SLBM's in production. They have three ICBM's in production and they have a half dozen in advanced development that we expect are going to go to testing. So they have a hot production base and, without any sort of constraints, they can keep fielding systems without the production delays with which we are faced.

I believe that the limitation on the number of multiple independently targetable reentry vehicles, what we call MIRV's, permissible on each missile is a start. It is important because the Soviets have the throw weight capability that would enable them to increase that number, especially in the large systems such as the SS-18 and the SS-19.

I think that the overall limit of strategic delivery vehicles, while it should be reduced, at least is a number that we can count on. I look on any limitation of numbers as providing us time to strengthen our forces. If we have to compete with them in a head to head race with their hot production lines—and we have no hot production lines either in bomber or ICBM's—then we will have a great deal of difficulty ever regaining the 1977 balance of strategic power.

Senator NUNN. So, the talk about U.S. negotiating in the next 2 or 3 years from a position of strength really ignores some of the hot production features on their side and the lack thereof on our side?

General ELLIS. As I mentioned in my statement, I believe that the only way we are going to interest them in reopening SALT II would be to send our negotiators to the table with our strategic force earnestly in the process of modernization.

Senator NUNN. In the planning stages?

General ELLIS. Moving forward with a dedicated effort, appropriation of funds, identification of systems and establishment of initial operational capabilities.

Senator WARNER. If the Senator will yield, the Senator raises a very good point. The statements being made by the administration now are to the effect that Secretary Weinberger was explicit in saying in 6

months we will be ready. What you are saying in effect is that readiness should be reflected in a stack of paper orders combining authorizations and appropriations from Congress with existing orders with contractors now vice the hot line which can be cranked up in the Soviet Union to produce the actual hardware in a brief period of time.

Senator NUNN. No matter what we do in the next 6 months with appropriations or authorization or whatever, we are still going to be in basically the planning stages of our force while they have hot production capabilities. Isn't that the reality of it?

General ELLIS. Yes, but I think a firm indication on the part of the United States that we intend to build a new bomber, to field the MX and to go into advanced development on Trident II, will certainly gain more Soviet attention than if we had reopened negotiations last year.

Senator NUNN. I agree. Let me ask you a bottom line question and this is hypothetical in nature and I don't propose it as anything other than a hypothetical, but if you had a choice in looking at it from a narrow military point of view, not trying to consider all other features but from a pure strategic balance point of view, if you had a choice between signing SALT II as it now stands and having no agreement during the next 2 years, which choice would you opt for?

SALT II TREATY

General ELLIS. Last year I opted for ratifying SALT II because I did not believe that there was any chance of sending our same negotiators with our same defense programs back to the table. This year I believe that if this Nation firmly commits itself to a modernization program and it is established by the Congress and the executive branch, there are some things that will enable us to negotiate from a better position.

We should not go to any negotiations—where we have expressed intent and done these things that I have talked about—with grand expectations in terms of reduction in total numbers. [Deleted.]

We have an option in terms of the Backfire if we wanted to proceed with the FB-111 stretch, where they either count the Backfire or we develop a new system such as modifying the FB-111, which is also not a counter. There are some other aspects but they are minor in nature. I do not believe that we are going to get any reduction of heavy ICBM's from them in any negotiation at this point. I think the important point is to get the dialog going when they are in a position that causes them to listen a bit.

Senator NUNN. Again if you had the hypothetical choice of no agreement whatsoever or the agreement we have and those were your only two choices which would you opt for?

General ELLIS. If that were the case, and I do not think that is the case now, Senator, but if that were the case, I would have to say that I want those restrictions on numbers that are inherent in the treaty and the warheads.

Senator NUNN. You value them as being strategically important?

General ELLIS. I count them as part of force structure in terms of what we do not have to destroy.

Senator NUNN. Admiral Carr, would you have a view on that?

Admiral CARR. That is a tough question in the first place. I would agree with General Ellis that those are not the only two options.

Senator NUNN. I hope they are not the only two options but judging from past history I would be very surprised if we go in there with a totally new negotiating position and come out of there with anything in the next year or year and a half. I hope I am surprised pleasantly. I completely agree that we should go in there playing our cards. I think that has been one of the problems in the past. I am trying to determine how important the good provisions—I know all about the bad provisions in SALT II and there are plenty of them but I am trying to determine from you gentlemen how important the good provisions are on on SALT II to our overall strategic balance.

Admiral CARR. I agree that the most important provision is to limit and I would ultimately like to see them limit the forces-in-being. That is the important part of the treaty, of course, just as putting the ceilings on was important. Now we are trying to bring the ceiling down. That is what we ought to focus on.

General ELLIS. I would like to go back to the hot production base issue. We know how that used to be. We were that way. We had hot production bases in the 1950's and 1960's in our submarines, bomber and ICBM's. We know what is possible to do. We also know how long it takes to get them started again. I do not believe that we can underestimate Soviet production capability if they want to disregard ceilings. There has been an indication recently by a member of the Soviet delegation in Washington that they are not bound to that. I am not sure what that means, but it is important from a military point of view. It is important that the limits be maintained in any way we can do it with honor.

Senator NUNN. May I take just a minute more, Mr. Chairman? I have another hearing.

Senator WARNER. Go ahead.

Senator NUNN. Suppose they just decide they are going to forget the SALT Treaty? Suppose we go in with a new negotiating position? They say forget it, we are going on with full production, what are the consequences of strategic balance if they exercise their capabilities over the next 24 months absent SALT II and absent any defacto adherence to it? What are the consequences in 2 years assuming again that we do everything within our power during the same period of time?

General ELLIS. They have not stopped their modernization program. Late last year they completed installation of their [deleted] of them are in position. They are composed of a variety of [deleted.] To me, that is an indication that they are going to do whatever they can within the scope of the SALT II Treaty. They can increase the number of warheads on the SS-18's to 10, [deleted] of them.

If they renounce the treaty and indicate they do not intend to abide by the limits any longer, with a hot production line and with the construction force that they have mobilized, they can begin building additional SS-18's and SS-19's and eventually additional fifth generation missiles.

Senator NUNN. If they do that, if we do all we can do, do exactly what you advocate in the next 2 years and they do all they can do

absent SALT II restrictions, will the strategic balance be better or worse in 2 years than it is right now?

General ELLIS. It will be worse.

Senator NUNN. Even if we carry out everything that you advocate?

General ELLIS. In 2 years?

Senator NUNN. Yes.

General ELLIS. All we are going to do in 2 years is spend money.

Senator NUNN. That is the point.

Senator WARNER. But it leads to the conclusion that we have no alternative but to buy what is on the table now in terms of the treaty.

Senator NUNN. I think we have to start to get the best of both worlds. I think we have to get the best part of SALT II. I assume you would say we want to get the good parts of SALT II if we possibly can by negotiation.

General ELLIS. If we can.

Senator WARNER. Is it the Senator's suggestion then that we would as a Nation lay out our program for strategic modernization and say here it is even though it is on paper and then we return to the negotiating table?

Senator NUNN. I don't know what my suggestion is now. I am really just trying to get the general's views on it. I do think as a Nation we have probably dwelled almost exclusively on the bad points of SALT II, and I have pointed them out myself, and ignored the good parts. I think the good parts do affect the strategic balance. I think there has to begin to be a recognition of that in this committee and in the administration.

There are some good parts to SALT II that are enormously important to the strategic balance. I assume you agree with that, General Ellis.

General ELLIS. I do.

Senator JACKSON. Mr. Chairman, as I understand the scenario here, no matter what the Soviets do we have a 2 or 3 year period where we are going to be spending money and not have it. However, I do not think that that means that we should establish a precedent, and you alluded to it, general, of allowing them to exclude the Backfire and also let them have the heavy missiles. I am merely saying that it seems to me that no matter what scenario you propose we are going to be in a period of danger here. I do not believe the Russians are as reckless as some others imply from time to time. I was amazed at Afghanistan when some of the born again hawks suddenly came on the scene and tried to tell us that we are going to have war.

There is an old Russian proverb, you know, "Don't go into the ford unless you know what is in the river." A lot of our people ought to memorize that. I agree with Senator Nunn, regarding the good points that are involved in SALT, but I think it is a mistake to start talking about sitting down right away and negotiating with them even in 6 months. Keep them guessing. They are not about to start a nuclear war if they know we have the ability to inflict unacceptable damage, and I think we have. I think there are things that we can do in this period and not get stuck with an agreement that is going to establish a capability on through the 1980's and 1990's in which they will be able to maintain a military superiority either in reality or in perception

by others, so that they can work their political and diplomatic will at their pleasure.

I think that we have a tendency to either go off on one extreme or the other. I just want to say that for the record. General, I must say that I feel a greater degree of confidence in you and your colleagues and your professional abilities to deal with this threat. They are not likely to do some wild and reckless things from the standpoint of deployment of their strategic forces to start a nuclear war. I do think, however, and I have been saying it for 25 years, that their objective is to achieve their goals politically and diplomatically, whether it is Finlandization or primacy, as the scholars call it, or as some of us call it plain blackmail. I think that is how they want to move. Our biggest deficit is in the lack of conventional forces that we can deploy and provide credibility in a given region like the Middle East, like Southwest Asia. I just want to say that for the record, Mr. Chairman.

I do think that we get a little bit too pessimistic on some of these issues.

Senator WARNER. I do want to make this observation. I believe that the public is of the opinion that we can very quickly take steps to remedy this imbalance and then go to the negotiating table with a handful of chips. It just is not possible as we know, those of us who have spent years in this work.

Senator Quayle, you have been very patient.

IMBALANCE WIDENING

Senator QUAYLE. I have enjoyed the dialog. Let me get one thing clear following Senator Jackson and Senator NUNN. Your response to Senator Nunn's question is in 2 years you see the imbalance being worse strategically than it is today? Is that correct, assuming nothing happens in the interim?

General ELLIS. I will show you in a few minutes how the imbalance has deepened since last year and we will show you the balance projected over the next 10 years under the presently approved programs.

Senator QUAYLE. In other words, that gap is going to widen in the next 10 years?

General ELLIS. It reaches a point in the middle 1980's where it levels off. It is already well down in the trough. It does not get much deeper if they do not do anything more than we have projected under the ceilings of SALT II. It does not start coming up very fast either until the Trident, the MX and the ALCM come on line in operational numbers, which is after 1985.

Senator QUAYLE. Without having SALT II and no commitment on ceilings is the MX going to be vulnerable? Do you perceive this as a problem?

SURVIVING ICBM FORCE

General ELLIS. Under the SALT II ceilings, the MX basing scheme with the 4,600 shelters and 200 missiles will provide us with an adequate force to ride out an attack and still respond to satisfy our historic requirements on the ICBM contribution to the Triad. If there is a breakout on the part of the Soviets, then we must expand the number of aim points that they have to consider. As long as we maintain the mobility of the MX and as long as we are able to keep

the aim points consistent with their warhead growth, then we will have a surviving ICBM force.

Senator QUAYLE. Do you think that the Soviet Union intends to go beyond the ceiling? Do you have any idea—

General ELLIS. That would be pure speculation, Senator. I agree with Senator Jackson that those people respect our capability. I believe they respect our national intent once fully focused and put into action. I believe that the last thing they want is to get in an arms race with the United States.

Senator QUAYLE. Since 1962 they have done a pretty good job of escalating.

General ELLIS. We have not kept pace. If we had maintained the programs that we had in the 1960's, modernized them and increased them as necessary, there is a possibility they might not have gone as far as they did and would have resorted to meaningful negotiation a lot sooner. They have no reason to do it now.

Senator WARNER. If the Senator will yield, Admiral Carr, do you wish to add some observations to these comments?

Admiral CARR. My only comment is, and General Ellis made it, that if we place the hardware part of the strategic balance aside, the national will is a major part of deterrence. I think just putting the programs into place, and having that strong national will, will have a major deterrent effect even though we have not brought the programs into fruition. I think that ought to be added on the balance side.

We only deal in capabilities in the military and obviously it is going to be down but a strong national will provides some balance.

Senator WARNER. The perception that we will not only use what we have but that we are going to modernize.

Thank you, Senator.

Senator QUAYLE. Did you read the James Woolsey article in the Washington Post the other day about the backlog will take billions? Let me read a couple of the points here.

"Our Air Force pilots are given only enough fuel to fly 10 hours a month. Israeli pilots by comparison can fly 30." Is that true?

General ELLIS. I was talking with the Chief of Staff and the Vice Chief of Staff of the Air Force yesterday and they indicated that both those numbers were wrong.

Senator QUAYLE. Do you know what the numbers are?

General ELLIS. I cannot give you the specific numbers.

Senator QUAYLE. Are they worse or better for us?

General ELLIS. You mean in terms of hours?

Senator QUAYLE. In terms of readiness?

General ELLIS. Senator, this afternoon at the preparedness hearing, the people who are responsible for the fighter forces will be able to answer that question in detail. I would not want to indicate the readiness of our bomber pilots.

Senator QUAYLE. In other words, we do have more fuel than just giving them the ability to fly 10 hours a month. Is that right?

General ELLIS. It is my understanding that the 10 hours is wrong as far as fighter forces are concerned.

[Additional information follows:]

AVERAGE FLYING TIME

At the present time, fuel quantities are not the limiting factor in the training of our forces—funding is. Funding for fuel, supplies, spare parts and a host of other training and readiness-related requirements limit the level of readiness we can achieve. As to the figure of 10 hours per month quoted in the article, I am unable to determine the original source. I can, however, comment on the training that we know our pilots have received.

While it is possible that some pilots might fly at a less than desirable rate for a short period of time, due to weather or a unit transitioning from one aircraft to another, it would not represent the level of training that the majority of our pilots achieved. In fiscal year 1980, the line pilots in my command averaged 22.8 hours in the B-52 and around 16.5 hours in both the KC-135 and FB-111. The line pilots in the fighter forces achieved an average of about 15 hours per month (F-4/14.1, F-111/16.6, F-15/13.7, A-10/19.1). The monthly average for line pilots in the airlift force was over 15 hours in the C-5, 27 in the C-130, and 32 in the C-141.

Senator QUAYLE. We will get those specifics this afternoon. What about some pilots firing air-to-air missiles only once in their career? Is that true?

General ELLIS. Again, you are out of my field.

[Additional information follows:]

FIRE AIR-TO-AIR MISSILE

It is possible that some pilots fire a live missile only once in their career; however, that is not representative of our present training programs. Our current rate of firing provides a live launch for each air superiority aircrew approximately every third year. Of course, we would like to fire more often, but many other training requirements are currently underfunded and have higher priority for additional moneys.

PENETRATING BOMBER

Senator QUAYLE. Have you come down with your own opinion on what kinds of manned penetrating bomber we ought to have?

General ELLIS. Yes. In my statement I indicated we need two. We need an interim bomber and we need one for the 1990's and out years.

Senator QUAYLE. The interim bomber is what?

General ELLIS. Either the B-1 or stretched FB-111.

Senator QUAYLE. Which one would you choose?

General ELLIS. We have not finished our evaluation.

Senator QUAYLE. I was on Grissom Air Force Base at Kokomo, Ind., and had a good briefing on the KC-135 tanker operations and I enjoyed it. One very disheartening aspect at the conclusion of the presentation was that they pointed out, I believe it was, some 236 out of 4,000 people who are on base there are eligible for food stamps. They said really more of them would go down but there is a degree of, not integrity but the fact they just don't like it.

General ELLIS. Grissom is a Strategic Air Command base. I know that in 1980 people at the Strategic Air Command bases redeemed nearly \$2½ million worth of food stamps. To me that is disgraceful.

Senator QUAYLE. I agree. After coming through this whole thing they came up with this factor which was quite alarming.

What two or three things, specific things, do we have to do as a Nation to be able to create the perception and the reality that we are serious about rebuilding our defenses in this country?

General ELLIS. I do not think you can limit it to two or three, Senator. I believe you will find that there are urgent things that need to be done in our conventional and strategic forces in all four services. Certainly, modernization of both conventional and strategic forces is mandatory and, certainly, retention of our trained people and acquisition and recruiting of new people is important. We need to take proper action. Then of course the day-to-day maintenance of our base structure has suffered over the years. There are many, many things that need to be done. It is a staggering bill we have collected over the last 10 years.

Senator QUAYLE. Thank you, Mr. Chairman.

Senator WARNER. Senator Exon?

Senator EXON. Thank you, Mr. Chairman.

General, welcome, and Admiral Carr. I would like to go into this question with you, General, for background information for this committee.

B-1/FB-111

You testified on it before but I would like to get it on the record once again. We are now discussing the derivative of the B-1 and/or the FB-111 "stretch" that we have talked about on many occasions. If we go ahead with either of those developments, would you evaluate for me how vulnerable would they be to Soviet look-down, shoot-down defensive systems in the 1980's?

General ELLIS. In July, after the authorization bill in which the DOD was instructed to study a replacement bomber program, SAC undertook an in-depth evaluation of our bomber penetration problem. It is our opinion, as far as we can project using national intelligence estimates, which is 1990—and this is after a massive look—that either the B-1 or the Stretch FB-111 can satisfactorily penetrate during the 1980's. In the 1990's with the look-down shoot-down capability that the Soviets are building, the AWACS capability that they will be building [deleted] it will require a new technology bomber to get us into the 21st century.

That, of course, is the basis for our two bomber recommendation.

Senator EXON. General, over the past couple of years you have recommended the "stretch" FB-111 as the fastest way to improve our penetrating bomber capability as opposed to the B-1, from the standpoint of speed and getting it into action. Is that still your position?

General ELLIS. As I indicated to Senator Quayle, we are currently evaluating these two programs. There is no doubt in my mind that the B-1 overall—the B-1 Variant that is being talked about—is a more capable aircraft. [Deleted.] The question comes down to how soon can we get them and how much each costs and how does that cost fit into the overall defense budget. Generally, those factors seem to be holding as last year. Our technical people tell us that the stretch FB-111 will be available about 1 year earlier and the difference in cost is still on the ratio of about 2½ to 1.

Senator EXON. You say 1 year earlier. Let me pursue that a little further. If we go to the B-1 version of some type, a derivative, suppose we decide tomorrow that we are going to go ahead with the B-1 program in some form. When do you believe we could have aircraft in

the hands of SAC and in what numbers with the B-1 as opposed to going ahead with the FB-111 program?

General ELLIS. Mr. Chairman, if it would help the subcommittee, I am prepared to show a chart that compares the scheduling and the cost of the two programs as it now exists.

Senator Exon. It will be very helpful.

General ELLIS. I must emphasize that this is as of now and our evaluation is not completed.

[The chart follows:]

FB-111B/C - B-1 VARIANT
ESTIMATED COSTS AND SCHEDULES*

GO AHEAD - 1 JUN 81

CY	81	82	83	84	85	86	87
FB-111B/C MILESTONES			▲ 1st A/C	▲ IOC			
B-1 VARIANT MILESTONES				▲ 1st A/C	▲ IOC		
TOTALS							
FB-111B/C CUM DEL			2	25	82	142	150
B-1 VARIANT CUM DEL				1	27	75	100

	FB-111B/C	B-1 VARIANT
Costs	\$6-\$7B	\$12-\$18B

*Costs and schedules are approximate only and are based on an unconstrained budget. With FY 81 - \$300M and FY 82 - \$2.500M, the IOC slips to early CY 85 and late 86 respectively, and production buys would be adjusted accordingly. Replacement costs for the F-111D for TAC could add \$4.5B - \$5B to the costs for the FB-111B/C alternative. The quantities shown are notional numbers for cost purposes only; no force structure equivalence is intended. Final data will be contained in Joint OSD/Air Force Bomber Alternatives Study.

General ELLIS. Notice that we get our first FB-111 B/C aircraft in 1983, our first 15 aircraft operational squadron in 1984. Actually we will have 25 aircraft delivered in 1984.

We get our first B-1 aircraft in 1984. At the end of 1984 we will still have one. We will achieve initial operational capability, or IOC with the B-1 about 1 year later.

COST COMPARISON OF B-1/FB-111

Senator Exon. If I interpret those figures right, the B-1 would be more than double the cost of the FB-111. What about numbers?

General ELLIS. That is 150 FB-111B/C's and 100 B-1's.

Senator EXON. Granted the B-1 derivative would be a better airplane to carryout the total mission, including the cruise missile carriage and all these kinds of things. But if I understand your chart, you are still saying as of now that the FB-111 would put more "stock" in the hands of SAC earlier?

General ELLIS. That is correct. I must tell you, Senator, that Air Force people, people who wear the same uniform I do, can come to different conclusions. My job is to meet my directive as laid down by national guidance in terms of the objectives that we must accomplish in an emergency. I need additional forces as early as I can get them.

Senator EXON. Because you feel that we are in an emergency situation?

General ELLIS. I do.

Senator EXON. Admiral Carr, let me explore with you, and then I will ask General Ellis about the MX missile program. Are you one of those in the Pentagon who is seriously considering the deployment of MX in Minuteman silos?

Admiral CARR. I am not in the Pentagon, Senator. I am General Ellis' deputy.

Senator EXON. Let us not split hairs. Will you answer the question in whatever your capacity is?

Admiral CARR. Yes, sir, in my capacity as the vice director of the Joint Strategic Target Planning Staff, we can only accept the forces supplied to us by the combatant commanders, the CINC's. General Ellis is one of the CINC's.

We would not take any position on how the CINC's get forces that they supply us since we only target those forces. I would not like to answer the question since it is really not in my area of responsibility.

Senator EXON. General Ellis, you heard the question. You are not in the Pentagon either but you are in a very important wing of the Pentagon. How do you feel about the deployment of the MX Minuteman silos?

General ELLIS. In Minuteman silos?

Senator EXON. Yes.

General ELLIS. Our development people have examined that proposal in detail. We believe that there is but one advantage to be gained by doing that. We do not improve the vulnerability of the silo at all as they are still vulnerable. The one thing we gain is seven more warheads per surviving missile than we would have with the Minuteman III. At the same time, to do that the technical people estimate it would take a year longer for IOC than for the current MX program and the cost is—I will have to provide a figure for the record but it is a staggering cost. There are many things we would have to do in that area, not just fix the silos but roads, bridges, environmental surveys and everything else.

The bottom line is that it would interfere with the attainment of an IOC of MX in the basing mode we recommend.

[The information follows:]

MX IN MINUTEMAN SILOS

General ELLIS. In addition to the approximate \$5 billion for MX missiles development costs, which are independent of the basing mode, it would cost approximately \$14 billion in 1981 dollars to put 200 missiles (or \$22.5 billion for

400 missiles) in Minuteman silos. As you may know, only 400 Minuteman silos are deep enough to handle the MX without major excavation.

I stated earlier that I would provide a cost figure for placing MX missiles in Minuteman silos. Because of depth limitations of Minuteman silos, only 400 MX missiles can be emplaced without extensive modification to the other 600 silos. The cost to put 400 MX missiles in Minuteman silos is approximately \$24 billion.

Senator EXON. General, if I understand the program correctly, not only are we getting more from the MX payload; but we are also, and most critically important as I understand the design of the system—the mobility factor is as important as or almost as important than the ability to lift seven additional warheads with the MX. Is that a fair assessment of the situation?

General ELLIS. Senator, if we had the mobility in the Minuteman force that we are building into the MX force, the need for MX would not be as pressing.

Senator EXON. Thank you, general. I think that is a fair and direct answer to the question.

MX BASING

I would like to ask each of you—maybe you don't care to comment, Admiral Carr. General, I have been somewhat concerned with what appears to be further delay in the basing mode decision on the MX. In the last 2 years we have heard time and time again that the MX missile is the key to meeting that "window of vulnerability." There is no way we can match the Soviets now in that; therefore, we have to go ahead with the basing mode decision. It is now going to be delayed even further, as I understand it, and I for one am going to continue to press for a decision on the MX which I think has to be started under some acceptable basing mode in the western desert areas of the United States sometime "like tomorrow."

Would you generally agree with that?

General ELLIS. I agree we should reach the earliest possible IOC. I should tell you, Senator, in the review that is ongoing with the new administration, there has been no delay or freezing of the current development work on the program.

Senator EXON. It is going ahead on schedule?

General ELLIS. Yes, sir.

Senator WARNER. There are really two parts to the program, the missile and basing mode. Certainly there is no delay in the missile. I understand there has not been a decision made with respect to the basing mode that was presented to this committee at the conclusion of the last session of Congress. That is being reviewed by the administration and their recommendations should be forthcoming within a matter of weeks on the basing mode only.

Secretary Weinberger represented in his testimony that there was no delay in either the missile or the MPS system.

Senator EXON. I am somewhat concerned by what I hear over and over again—this business of let us go ahead and build the MX missile. Where are we going to put it? In a warehouse? I don't know that building an MX missile, when we do not have a place to shoot it from, is an answer to what I am concerned about, which is mobility of that

new missile to give us the protection which was the basic thrust of the need for the expensive program in the first instance.

Senator WARNER. I certainly share the Senator's concern to move ahead. I believe that the phasing of the missile and the launching mode are on schedule.

Senator EXON. If I may impose on the committee for one more question.

Senator WARNER. Take all the time you want, Senator.

LAUNCH PLATFORMS AT SEA

Senator EXON. I know that the Secretary is exploring the idea of having launch platforms at sea. Has there been any breakthrough on that mode that the committee has not been informed about?

General ELLIS. I am not sure exactly what aspects of sea basing the Secretary is studying. I do know that we have looked at several modes of maritime basing for the MX among the 35 different basing modes that we have examined. We felt that it did not meet the criteria that we were looking for.

Senator EXON. Admiral, you are a man of the sea. Can you enlighten me any on what is going on in the Pentagon? I believe you did spend some time in the Pentagon not too long ago.

Admiral CARR. I spent 4 years in the Pentagon, sir, about 4 years ago.

Senator EXON. You have not been back on assignment to the Pentagon since 4 years ago?

Admiral CARR. I came back for about 3 weeks just prior to Christmas to assist the Governor of Texas in a project.

Senator EXON. The reason I ask you about that is that I know the Governor of Texas is one of the members of the transition team who was pushing very hard, and still is pushing hard, for deployment of the MX in the Minuteman silos. That is why I asked you the question.

Admiral CARR. If you know the Governor of Texas, you know that I do not have much influence on which way he pushes.

Senator EXON. I surrender, Mr. Chairman.

Senator JACKSON. Beware of Governors.

Senator EXON. No, no. Beware of people who work for Governors.

Senator WARNER. Admiral Carr is very modest. He is a man who has accumulated a record of achievement and experience.

Admiral CARR. I would respond to the Senator's question about sea basing in one area and that is in the small submersible. My experience as a submarine commander is that it is tough to build a small submersible. It takes a lot of power to run a missile platform and a lot of trained people. It will be a very difficult job.

Senator WARNER. When we talked days ago you indicated that the basic power system, drive system and so forth needed to even carry one missile requires a boat of substantial size.

Admiral CARR. You have to have a submarine.

Senator WARNER. You have to have a big submarine. You may as well pack a couple more missiles in it and if you do that you are pushing yourself to the existing Trident.

Admiral CARR. [Deleted.]

Senator WARNER. Senator Jackson?

Senator JACKSON. I want to follow up on a couple of matters, Mr. Chairman.

HARDENING SILO SITES

Senator JACKSON. General Ellis, I know that in the past we have taken a look at the other option of hardening our Minuteman and Titan silo sites. The Soviets, of course, have hardened their sites substantially, have they not?

General ELLIS. They have, extremely hard.

Senator JACKSON. What is SAC's view as a follow-on option beyond the MX to keep the Minuteman missiles but harden those sites? What sort of possibility exists there for having any kind of survivability?

General ELLIS. Senator, we discussed this late last year with the Ballistic Missile Office of the Air Force, the experts we consult with on such matters. They indicated that it is [deleted].

Senator JACKSON. And you have in addition, of course, that ongoing "EMP" problem?

General ELLIS. We do.

Senator JACKSON. We still do not know enough about the problem. We have a pretty good idea that it means that you do not literally have to blast it out, but you can create a situation in which the system will not function?

General ELLIS. [Deleted.]

We believe that from a purely EMP point of view—I am not talking about command and control, I am talking about operation of the missile—we believe those Minuteman III [deleted].

Senator JACKSON. As far as hardening, that option has been pretty well dismissed beyond what you have done for the Minuteman III. How many PSI are we talking about? Minuteman III is the one that is hardened the most?

General ELLIS. We are talking [deleted] PSI compared to the Soviets' [deleted].

Senator JACKSON. What is our judgment, based on our current accuracy, on what kind of yield would have to be used against that kind of hardening?

General ELLIS. Our calculations, Senator, indicate that with the [deleted] we hope to achieve with the MX, and the yield that is programmed for the MX, we achieve get over [deleted] probability of severe damage.

Senator JACKSON. So they would not be able to function?

General ELLIS. That is right.

COUNTERFORCE CAPABILITY

Senator JACKSON. What about our current counterforce capability as far as the Minuteman family is concerned?

General ELLIS. [Deleted] sir, probability of severe damage.

Senator JACKSON. It is not too high?

General ELLIS. No; it is not.

Senator JACKSON. Would the yield make a difference? The yield and the accuracy are the critical components here. You simply would have to increase yield because accuracy is not going to get much better in the time frame of the eighties?

General ELLIS. We do not expect anything better than what the MX is projected for. There [deleted] that the nuclear weapons developers have come up with—technically, it has been [deleted]. We have been

very interested in securing that; but at the present time it is not in the program. The program is the MK-12A on the MX.

Senator JACKSON. Going back to the questions I asked about the cruise missile program and, of course, it applies to the other ongoing programs, the MX and Trident, have you made any recommendations on stepped-up production of special nuclear materials?

[Deleted.]

General ELLIS. Yes, sir. That is out of our area of responsibility other than to recognize. We take a look at the programs we have coming downstream—the ALCM, the MX—and we are satisfied that the warheads will be provided, the necessary material will be available, for our programs.

However, as a matter of general knowledge, we understand that [deleted].

Specifically, I would have to provide an answer for the record.

Senator JACKSON. I wish you would, especially if there is accelerated production of the cruise missile. We know pretty much what the program is supposed to be on the Trident and for the MX. It would seem to me that it is very important that you be in a position of exercising the option of increasing the numbers of ALCM's, GLCM's and SLCM's for which you could accelerate production quite rapidly—provided that you [deleted].

I looked at this last year and I know [deleted] so I would like to have that judgment.

General ELLIS. Yes, sir.

[The information follows:]

SNM AVAILABILITY

General ELLIS. Senator Jackson, based on current projections, [deleted].

According to the 1981 DOE Nuclear Weapons Stockpile Memorandum, the DOE can accommodate ALCM warhead production up to [deleted]. Rates above this amount would require readjustments.

CRUISE MISSILE PROGRAM

As you may recall, former Secretary of Defense Brown chaired an NSC Study group [deleted]. The Services, through JCS representation on the study group, strongly supported and endorsed these actions. In the fiscal year 1981 and fiscal year 1982 budgets the Administration has included funds required by the Department of Energy (DOE) [deleted]. Assuming that funding beyond fiscal year 1982 is provided to complete these actions, DOE has stated that [deleted]. An assessment of the technical risk associated with each of these options must be addressed by DOE rather than by the AF. [Deleted.] The Navy would be the appropriate agency to address any specific questions you have regarding [deleted].

Senator WARNER. Senator Quayle?

Senator QUAYLE. No questions, Mr. Chairman.

Senator WARNER. Senator Exon?

Senator EXON. No further questions, Mr. Chairman.

Senator JACKSON. I will just ask one other question here, and then we will turn to the briefing on the strategic balance part of it.

Do you have any information as to (a) whether the Russians are planning a system comparable to the basing mode of the MX? We know, of course, about the mobile missile, the SS-16, which they have currently not deployed and on which they ran into some trouble, I

gather, in that weapon system. Do you have any information at all on their plans in this regard?

General ELLIS. Senator, the latest national intelligence estimate indicates that in the fifth generation programs under development there will be a [deleted].

Senator JACKSON. A follow-on to basically the [deleted].

General ELLIS. I will have to submit something specific for the record, sir. I assume it is an intercontinental missile; it is not a theater missile.

[The information follows:]

SOVIET MOBILE MISSILE

General ELLIS. Senator Nunn, the National Estimate projects [deleted] whose initial [deleted] deployment could [deleted]. Under SALT-limited estimates, this [deleted] could appear in [deleted]. Another option, [deleted]. This [deleted] is assessed to be a follow-on to the [deleted].

Senator JACKSON. I was wondering whether it involved a whole new technology beyond the [deleted].

General ELLIS. [Deleted.]

At the moment it is not, because it is [deleted]. I am in the area of speculation at this point, Senator.

Senator JACKSON. Let me ask you, wearing a Russian planner's hat, how would they view the MX in the proposed basing mode that has been publicly discussed?

General ELLIS. I have never been able to figure out how those guys think except, as you say, they are very pragmatic. I know that they do their homework well and they test and exercise to a degree that the United States and indeed the Western World is not so familiar.

I would have to say that if they see a basing concept which allows mobility and change of location—a reconfiguration of the force, if you prefer—within the flight time of a missile to its target, plus the fact that the whole system can be expanded, that it would be an effective system and a difficult system to overwhelm if we kept it at the proper size relative to the threat.

Senator JACKSON. How many warheads would they have to put on a target area of MX—you have war gamed this, I am sure, but that is part of the reason for the basing mode—to get accuracy that would prevent the launch of the MX? It would be pretty hard to overwhelm it?

General ELLIS. In the red integrated strategic operations plan which is put together in the Pentagon, [deleted] are normally targeted on every ICBM silo. With the 4,600 MX aim points, the Soviets would probably [deleted].

SOVIET EXPENDITURES FOR STRATEGIC ARMS

Senator JACKSON. My last question: Don't they reach a point in the expenditure of their resources for offensive strategic arms to say enough is enough? In other words, I question the doctrine that the Russians will just go on an unlimited basis of producing far more strategic arms than they need, knowing that we will not be the country that is going to move first.

They have all the advantage of the offense by which we would have to retaliate on empty silos.

With their economic problems, I am wondering, trying to forecast the future, whether they are going to get involved on an open-ended basis in terms of just turning out an excessively large number of missiles, strategic systems, beyond the need to overwhelm the United States?

I realize this is a difficult argument to make, but I just personally question whether they will go on and on and on just turning out unlimited numbers of 18's and 19's; whatever.

General ELLIS. With all respect, sir, and again recognizing that this is a subjective judgment, I have heard this statement for many years while the Soviets have continued to submerge their economy and their other priorities to strategic arms buildup. It is my opinion that, as long as it seems to be a feasible course of action, which it has been for the last 10 years, they intend to achieve superiority.

Senator JACKSON. I have never argued to the contrary. In fact, I led a fight against a guy named Paul Warnke who believed in the limited force doctrine: All you have to do is lay some bombs down on Russia and that is all the deterrence you need. That is not what I am getting at.

My point is that when they have reached that number where they have a strategic system that can overwhelm the United States, do they go beyond that, considering all the other problems that they have? They have problems to maintain their general purpose forces. They have enormous economic problems.

My point is that they can reach a point where enough is enough and where they have confidence in those numbers.

You know, the argument is that we cannot get into an arms race with the Soviets because they will just go on and on to a horrendous level. This was the argument in SALT II, that we ought to give in here, here and there, otherwise there are unlimited numbers of weapons that they will turn out. I just do not buy that philosophy, that they reach a cutoff point that meets and fulfills their strategic needs. I do not feel it is open-ended. I agree completely that the Soviets have been able to do one thing very, very well, and that is, to produce huge strategic weapon systems. They went for the big one. That all goes back to the Cuban missile crisis. I think it is clear, those of us who were warning way back then, even before, that that was the course that they were going to follow and they would never again be caught short on general purpose forces. For instance, they did not then have a strong navy. They are not going to be caught short again where we have the upper hand in terms of strategic arms to be dictated to as they were in October 1962.

General ELLIS. I would not have any argument with your basic judgment, Senator. I think as a military man when you are satisfied and you have confidence that under all feasible course of war initiation you can prevail, that you would keep that position and then go about doing other things.

RUSSIA'S AIRBORNE STRATEGIC FORCE

Senator QUAYLE. May I ask a follow-on question?

Where do they stand and what do you think they are going to do with their airborne strategic force, mainly the Backfire bomber, their

cruise missile program, their tanker program? Do you see an acceleration in this area?

General ELLIS. They have their Backfire in production at the rate of $2\frac{1}{2}$ a month, as best we can verify. [Deleted.] They are working in all of these areas and intend to go into production on the programs that I have mentioned.

Senator QUAYLE. When that becomes fully operational, what kind of problem does it present to us?

General ELLIS. If what becomes operational?

Senator QUAYLE. The whole airborne strategic force.

General ELLIS. It is a very difficult problem, Senator, because we have no air defense to speak of.

Senator QUAYLE. Do you perceive at some point this will become operational?

General ELLIS. If I were a Soviet planner, I would maintain a viable Triad just like my adversary, the United States, does, because it provides certain advantages that cover for other disadvantages in the other legs.

Senator QUAYLE. If they go ahead and provide that Triad, what new weaknesses do we have?

General ELLIS. We have no air defense system that remotely compares with the defensive structure that Senator Jackson referred to earlier. It is a defense system that is in constant upgrade. It includes all facets of air defense—fighters, AWACS, ground surveillance radars, surface-to-air missiles, and the manning that goes along with that. We are very vulnerable to their air-breathing leg of the Triad, the Backfire.

Senator QUAYLE. Do you think we ought to be doing something more in the area?

General ELLIS. I do.

Senator WARNER. Before the witness proceeds with his second briefing, I will exercise my opportunity to ask a few questions addressed to your statement.

On page 1 you seem to indicate your reaffirmation of the Triad concept and therefore you personally would not favor a major departure from the land-based system to the sea-based system as now suggested by some, that the MX system be deployed at sea, as opposed to land?

General ELLIS. I would not, Mr. Chairman. Each leg of the Triad—and it has been proven over the years—has certain strengths and certain weaknesses. The strengths of the one system cover for weaknesses in the other systems, and vice versa.

I think it is important that we maintain the Triad as we recognize it, not because of historical preference but because of the effective deterrent that it has turned out to be.

Senator WARNER. Therefore, as a professional you would not align yourself with those who suggest the Triad be weakened by putting MX at sea?

General ELLIS. I would not.

INTERIM BOMBER NARROWED TO B-1 OR FB-111

Senator WARNER. I certainly concur in your observation on page 3 that the Congress should not try to drive the Department of Defense

in such a way as to degrade their analysis of the manned penetrating bomber and be given the time that is necessary. That may well occasion some unusual procedures here in the committee by way of authorizing the funds until such time as those designs are finalized.

On page 5 you indicate the candidate aircraft for the interim bomber have been narrowed by the Air Force to two, to either a modified FB-111 or some version of the B-1. My understanding is that there are two versions of the B-1 now under consideration. You are evaluating both?

General ELLIS. Yes, sir. We are looking at a variant which is the one that would carry the cruise missiles, and we are looking at the so-called minimod, which is an upgrade of the straight penetrator.

Senator WARNER. In that vein, that is the historical genesis for the emphasis on the Soviet Union on land-based systems vice our emphasis initially on the B-52, the manned penetrating bomber system?

General ELLIS. That is an interesting question and I cannot answer it precisely. I believe they felt that through espionage and other means they understood and obtained the nuclear warhead wherewithal, they required to build first the single warhead and then the MIRV. After World War II they took a lot of German rocket scientists back to Russia with them. I assume they felt themselves more capable in that area than in the bomber area.

Senator WARNER. Do we have any intelligence that indicates that they are working on a follow-on bomber to the Backfire? The Backfire does have some inherent limitations, that is, compared with the B-52 and our B-1 or FB-111 version?

General ELLIS. It would make an excellent penetrator, especially against our deficient North American air defense. It could use additional range. They do not have the refueling force that we have. We do have indications that they are developing an advanced bomber.

Senator WARNER. Those indications are that it is something comparable to the B-1? What do we know about it?

General ELLIS. [Deleted.]

Senator WARNER. So we really know very little about it, and we have to wait until they pull it out from under the——

General ELLIS. [Deleted.]

Senator WARNER. I was meeting yesterday with the staff of the committee. We had a very interesting discussion on the extent to which we should incorporate into our design of the new system, principally the MX system, those features which would lend the system to a future arms control agreement, primarily in the verification area.

What are your observations on the extent to which we should compromise any operational advantages such that we could, at a later date, enable that system to meet, shall we say, accepted fair standards of arms control agreement as we know them today?

Here we are proceeding now with a series of systems—MX, a variant of the manned bomber and the cruise missile. To what extent should we design those operational systems so that they would fit a future arms control agreement?

General ELLIS. Senator, it is inconceivable to me that any administration would reject the need, the theory, the philosophy of arms control negotiations. I believe it to be fundamental if we are to have any sort of future at all. For that reason, one of SAC's basic requirements

for the MX is to insure that it is compatible with generally accepted arms control procedures.

One small part of that would be to retain the capability to either enlarge or contract the system without compromising the basic system in order to meet the proposed threat or to satisfy arms control reductions.

It is an integral consideration in any weapon system that we build and I think our technology will provide ways to work around it.

That is not to say that we should not try to get more precise arms control techniques. I am talking about onsite inspections. It seems to me that is something we have neglected over the years and I believe we should continue to push for that every time we sit down with the Soviets, because until we get that, we are never really going to have any highly technical arms control.

TECHNICAL ARMS CONTROL

Senator WARNER. Let us dwell on that for a minute. From your own experience and study of Soviet history, do you think it is a reality that they would accept onsite inspection, that type of onsite inspection which would give us adequate assurance that they are complying? Is it an achievable goal?

General ELLIS. I think so. I do not believe they are going to let us go into their factories initially. I think that any commander would recognize that by counting missiles in silos, removing the shroud and counting the warheads you are not learning anything that has not been observed before.

I do not think we should expect access to very secret or classified research and development. I do not think we should expect access, initially at any rate, to production capabilities. I certainly believe that on recognized deployed systems, it is a reasonable way to start, using either the main parties or third parties.

Senator WARNER. My question, Senator Jackson, was to what extent should we compromise, if at all, the operation advantages of any new system, be it cruise, MX, or the manned bomber, such that those systems at a later date would be compatible with known parameters of a fair and equitable arms control agreement?

Senator JACKSON. I think that basically what we must do is insist in any kind of ultimate agreement with the Soviets that we have equality in terms of ability to defend ourselves. This is where I think their position is one that we simply cannot accept.

The other big part of it is what you are just referring to, verifiability. I have real reservations about how far the Soviets will go in that regard. I should say Russians because they have always, from Czarist times, been very suspicious about outsiders or anyone looking in. That is inherent in their culture and their thinking and they are going to be very, very difficult.

I must say that the big problem that we have with SALT and the road that we were traveling is the assumption that they needed to have more to defend themselves than we did. That is where you have to part company, because the fundamental problem is the political application of military power in the nuclear age. In that area, the Soviets, I think, are counting heavily on the way they are perceived in the world so that others will follow the route of Finland and so

that other countries will consciously or subconsciously simply adjust to meet their situation.

RELIABILITY OF WARSAW PACT ALLIES

That is part of our problem in NATO. Our problem is with the political left in NATO. That is why I think that the situation in Poland, Mr. Chairman, involves a fundamental issue that is not being discussed in the press. I think the one thing that would hold the Russians back from not moving if they see a bloodbath, that would then expose the Warsaw Pact to its ultimate deficiency of lack of reliability in the event of attack. They count on [deleted] of their ground forces coming, I believe, according to the briefing we had here the other day, [deleted] of their ground forces in a move against Western Europe would come out of the Warsaw Pact; isn't that true, General? And what the Russians must not allow to happen is for the world to know that they have no reliable allies in the Warsaw Pact group except Bulgaria. Bulgaria is more Russian than Russia. Russia is only 47 percent Great Russian, and with 152 nationalities and ethnic groups, they have real, real problems that their General Staff must be thinking over carefully.

Czechoslovakia was one thing. There they removed in 48 hours, and they are poised now to inhibit every Polish division. But I think that while they are on the horns of a dilemma, they cannot allow Solidarity to supersede the Communist Party. All power comes from the Communist Party and they cannot allow it to stand in the way; but if they move militarily, then they could be exposed as having virtually a nonalliance situation.

I think that must be their real dilemma right now. If the Poles fight and they have a bloodbath, then clearly the East Germans may not be reliable and all the rest of them except Bulgaria.

This is a philosophical argument.

General ELLIS. I have no objection to anything you have said, Senator. I would argue that they have tremendous problems with any kind of military action in Poland.

Senator JACKSON. I am sorry I will miss this, but I will get the record. I have an 11 a.m. meeting that I have to attend.

FUTURE STRATEGIC BALANCE

Senator WARNER. General Ellis, your analysis of the future strategic balance is based upon the actual 5-year plan for strategic programing. Historically, the 5-year plans have proven to be optimistic, with U.S. program funding being less than originally planned. Doesn't this give you a built-in error in your analysis which implies that the future balance will actually be worse than you have projected?

General ELLIS. No, sir. If the programs are slipped or canceled, then they will be reflected in a reverse mode to the charge you have seen.

Senator WARNER. I will ask the witnesses to bear with me a little bit here. I am going to go through a series of questions. Does your time enable you to remain for a period?

General ELLIS. Yes, sir.

Senator WARNER. In the early 1970's the notion was accepted that since we were not going to defend ourselves against ICBM's, that is the ABM Treaty, it makes no sense to defend against the bomber. The

strategic air defense is relegated to the Tactical Air Command as an ancillary mission. The mission has suffered from inadequate resources, modernization, and the usual problems.

Recent incursions in our space by Soviet aircraft have pointed up our deficiencies.

From an operational point of view, recognizing that this mission does not fall within your immediate area in terms of responsibility, how would you characterize our strategic air defense capability today?

General ELLIS. Very weak to poor. They are very limited and could only begin to act in response to very light attacks.

Senator WARNER. On the order of priorities, we seem to be gaining momentum in support of the MX and the manned penetrator and the follow-on system, requiring a good deal of investment in R. & D., together with a cruise missile program. I don't know where the dollars are going to come from. I would presume, therefore, that if you have to order the priorities, you would favor the MX, the manned penetrator, to the extent that we accelerate the cruise missile program rather than divert dollars into the defense?

General ELLIS. I must say, Senator, that considering the position we are in today, I need the strategic offensive forces that give me at least the flexibility to measure up to the capabilities that the other side has.

I think the fact that we do not provide strong defense at this time is acknowledgement of the smaller aspect of his strategic penetrator role. I still have to objectively favor offensive forces.

Senator WARNER. I am going to insert the balance of these questions into the record and ask that you answer them at your convenience.

General ELLIS. Yes, sir.

Senator WARNER. The ABM system has been the subject of considerable and growing interest in recent years. This is due to several factors, development of more promising ABM technology relative to the sudden appearance of high accuracy Soviet ICBM systems and escalation of the MX basing controversy. These programs are administered by the Army but, if deployed to defend ICBM silos, I presume would come under your jurisdiction. Is that correct?

General ELLIS. I am not sure of the exact command structure that would result. Certainly, if it were not under the strategic air commander, it would have to be closely coordinated and measured into offensive operational requirements.

Senator WARNER. Looking at the priorities of dollars where would you put a rejuvenation of the ABM?

General ELLIS. We should increase the R. & D. that is going into ABM. [Deleted.] I would certainly encourage continuing R. & D. because we must recognize that if there is a breakout, one of the alternatives for the ICBM force is to protect it with ABM.

Senator WARNER. I will put into the record additional questions on the ABM for your answers.

TARGETING MINUTEMAN III

Admiral Carr, during my visit last week with General Ellis, you, and your staff, I received much the same data as today, but I have been thinking on the targeting question. If the Soviets launch, how do you

rearrange your targeting of our Minuteman III now? You would not fire them on their empty holes.

Admiral CARR. We target only the silos.

Senator WARNER. That puzzles me. Why would we expend that amount of ordnance on empty holes recognizing there is a reload factor. Why would we not retarget those in other areas?

Admiral CARR. [Deleted.]

Senator WARNER. You mean [deleted].

Admiral CARR. That is correct.

Senator WARNER. That is a good point.

Admiral CARR. [Deleted.]

Senator WARNER. I have much to learn. I still have difficulty comprehending what is left here after that initial exchange. Nevertheless I presume you have studied the option of assuming it is technically feasible, as I understand it is, to retarget the Minuteman missiles. What is the timing? I was told it was fairly short.

Admiral CARR. [Deleted.] Senator, it is very short.

Senator WARNER. It is your considered professional judgment you should go ahead and bring them in [deleted] rather than redirect them into industrial or political targets?

Admiral CARR. We always retain the necessary force to cover political and industrial targets. As long as we have force structure available, any military target we can destroy results in that much less damage to the United States.

Senator WARNER. President Carter made the statement to the effect that one submarine was sufficient to handle our retaliatory capability. What was the genesis of that and did he later correct or amplify that comment?

Admiral CARR. I do not know whether he changed it or not. I do not know his exact statement either. As you can see from the number of targets we showed you today, one submarine will not handle that kind of assignment.

Senator WARNER. Do you know why he strayed so far from the actual fact at the time that he made the statement?

Admiral CARR. I do not know his statement nor do I know what he had in mind.

Senator WARNER. Does anybody in the room recollect the statement?

STAFF. I believe it was to the effect that one Poseidon submarine had a capability to hit two hundred targets in the Soviet Union, a number of major cities.

Senator WARNER. In recent years we have seen our strategic posture transformed from one of "massive retaliation" through "sufficiency," "parity," "essential equivalence" and "rough equivalence" to the "imbalance" and perhaps to inferiority which characterizes the so-called window of vulnerability which will exist until the deployment of the MX missile. As the operational commander responsible for strategic nuclear forces, General Ellis, you are uniquely qualified to comment on this strategic balance today.

IDENTIFYING IMBALANCE

In your opening statement you used the words "serious" to identify the imbalance. My recollection is that the Secretary of Defense did not use that word. He just stated that there was an imbalance. Is there a difference of viewpoint between you and Secretary Weinberger?

General ELLIS. I have seen only the press reports and news accounts of his statements and his hearings here before the Armed Services Committee. I am not sure just how he used that term. I interpreted it the way I believed it should be interpreted, that he recognized there was an imbalance in the sense we have portrayed this morning. I really cannot say.

Senator WARNER. In my humble judgment the charts certainly substantiate your use of the word serious. I recognize it is very early in the new administration and I do not mean to be critical. I hope you have the opportunity to talk to the President or to the Secretary of Defense and share your viewpoints so as to speak with one voice or, if not, we clearly will know the magnitude of the difference of opinions between yourself and the Secretary of Defense.

General ELLIS. I have had a small correspondence with Secretary Weinberger. He has indicated that as soon as his schedule permits he intends to visit our headquarters. At that time I hope to introduce him to our analysis.

Senator WARNER. In your judgment, what is the magnitude of the deterioration which has taken place in the last 12 months?

General ELLIS. For the last 12 months, for the most part, the Soviets have completed fielding their fourth generation missiles. The big dip happened in 1980 when we went from just below the balance line of 1977 to well down into the depths of the difference in hard target kill capability and military kill capability.

[Deleted.]

Senator WARNER. You spoke of the 1977 baseline used as the consolidated guidance for calculating the essential equivalence. Are you still comfortable with that baseline?

General ELLIS. In 1977, according to our measurements with procedures we have for conducting these analyses, we had the strategic nuclear capability then that we considered adequate in terms of hard target kill, military kill, and in terms of industrial kill.

Senator WARNER. I think you have covered this but I would like to have it succinctly in the record once again. Last year you testified "Even with the modernization effort now programed we cannot regain our mid-1977 level of damage capability any time in the eighties."

What effect would procurement in substantial numbers, perhaps as high a level as 100, of the new manned penetrating bombers have on that calculation?

General ELLIS. It will provide a capability to restore the 1977 level. If you would like to see it we have some charts we can show you.

Senator WARNER. That is one program that could restore the 1977 level?

General ELLIS. That is correct, when added to current programs.

Senator WARNER. If brought in with an IOC in 1980?

General ELLIS. The IOC is projected for either the FB-111B/C or the B-1.

Senator WARNER. Let us take a look at the chart.

[Additional information follows:]

TRENDS IN U.S. RETALIATORY CAPABILITY

This chart covers both the day-to-day alert scenario and the fully generated scenario where sufficient warning is given to bring our forces to maximum readi-

ness—the remaining [deleted] of the bombers and in-port submarines. For the alert scenario, 150 FB-111B/C's could restore our [deleted].

In the fully generated scenario, the [deleted].
[Chart deleted.]

Senator WARNER. The comparison shows the FB-111 program starting 1½ or 2 years ahead.

General ELLIS. About 1 year ahead of the B-1, equally capable forces.

Senator WARNER. Then the chart would simply shift to the right?

General ELLIS. Yes, sir.

Senator WARNER. Let us see the chart that is available.

[Additional information follows:]

B-1—FB-111B/C COMPARISON

The initial operational capability of the B-1 is one year later than for the FB-111B/C. Once both forces are fully operational, the 100 B-1's are equally capable to the 150 FB-111B/C's.

[Chart deleted.]

Senator WARNER. Thank you.

REENGINING KC-135

General, we talked about the reengining program of the KC-135. What is the dollar figure on that program?

General ELLIS. Do you mean for the entire force?

Senator WARNER. Yes.

General ELLIS. I will have to provide that for the record, sir, but it is roughly \$7 to \$9 billion. I will make this point though, Mr. Chairman. The life expectancy of the KC-135 is more than 25 years from now.

Senator WARNER. From now?

General ELLIS. Yes, sir, from now. So that in a major way we can introduce the changes in that.

Senator WARNER. The KC-135 system is integral to any future manned penetrators?

General ELLIS. And to the cruise missile force as well as to our conventional forces deploying to and within Europe, Pacific, and/or Southwest Asia. Additionally, strategic airlift C-141's, C-5's and C-X when we get it will require air refueling. Senator Warner, as each day goes by our refueling requirement increases and, in my view, will continue to do so.

Senator WARNER. So it is a program that has to be done. It is a question of priorities and time?

General ELLIS. Yes, sir.

Senator WARNER. In the magnitude of \$7 billion?

General ELLIS. Sir, let me provide that for the record.

[The information follows:]

KC-135 REENGINEING COST

The flyaway cost is (fiscal year 1980 dollars) of a reengineed KC-135 is approximately \$10 million per copy. At this rate, reengining 642 aircraft would cost \$6.4 billion total. Actual production costs are now being negotiated and will be definitized during the ongoing DSARC process scheduled to be complete by 2 July 1981.

This cost estimate assumes that the program is supported at the \$250 million level in fiscal year 1982 and that production is authorized at the Air Force desired optimum production rate of six aircraft per month.

COST OF KC-135 FLEET REENGINEING

The entire KC-135 fleet modification with the CFM-56 engine, Mr. Chairman, all 615 tankers at \$15 million per aircraft would be \$9.4 billion in fiscal year 1981 dollars. This assumes a production decision this year with fleet modification complete in 1994.

Senator WARNER. What about the KC-10 program?

General ELLIS. We think the KC-10 is an important adjunct to our refueling capability, especially in terms of moving airlift and tactical forces great distances. We have demonstrated in several instances that the movement of forces to the Persian Gulf-Indian Ocean area without stopping at any bases—in other words, nonstop—is more difficult to do with KC-135's. The KC-10 program was terminated at about 12 in Mr. Carter's fiscal year 1982 proposal.

Senator WARNER. What year was the termination? What is the buy profile?

General ELLIS. At the moment with Mr. Carter's last budget, it would be terminated at 12. We recommend that it continue with a program of at least 32 aircraft.

Senator WARNER. Sketch for me the operational profile of the KC-10 versus the KC-135.

General ELLIS. The best comparison is that it is about the equal to an additional two to three KC-135's. Where we would require two plus tankers on a certain mission, we could do it with just under one KC-10.

[Additional information follows:]

REENGINEING KC-135—KC-10 COMPARISON

Both aircraft offer improvements in load capability. The reengineed KC-135A provides approximately 1.5 times more fuel, whereas the KC-10 gives two to three times more offload, depending on its cargo load. In terms of flexibility, it is operationally more effective to have six reengineed tankers, each having an increased offload of 40,000 pounds of fuel in six different locations, than to have one KC-10 with 240,000 pounds of fuel in one location.

Senator WARNER. Then you would stagger the time for the refueling operation?

General ELLIS. Yes, sir. We would pick the optimum point for the transfer. I might make a comparison of the Middle East situation.

Senator WARNER. Is range also a factor?

General ELLIS. Very much so. The KC-10 actually could accompany fighters to their deployment base while at the same time carrying over 100,000 pounds of cargo. It is not just a tanker. It is also a cargo carrier.

Senator WARNER. What is your first delivery date?

KC-10 DELIVERY SCHEDULE

General ELLIS. We get the first one in SAC, next month. Then we get the second one in another month or two. This year we will probably pickup six total of them. The KC-10 is in flight test now and just about ready to come to the operational squadron.

[Additional information follows:]

KC-10 DELIVERY

To be more specific, Mr. Chairman, we anticipate delivery of our first aircraft in mid-March of this year. SAC will then conduct six months of follow-on operational testing. We anticipate delivery of the second aircraft in July. We should have five aircraft in our inventory by the end of this fiscal year.

Senator WARNER. Starting with the B-52 program, you addressed the modification last year, will you bring us up to date on that?

General ELLIS. We are improving our offensive avionics system in the B-52 G and H force. In the G force, we are also incorporating the avionics and hardware required for the air launched cruise missile. We are upgrading both the G and H with certain defensive systems and we are updating the B-52D with certain navigational and bombing systems, mainly the SPN/GEANS inertial system. The program at the moment as far as the ALCM is concerned is on schedule and, with the proper 1982 funding, we will keep it on schedule.

Senator WARNER. At what point would you begin to either attenuate or terminate the B-52 program as the new manned penetrator begins to join the fleet? Do those curves cross out there?

General ELLIS. At the moment we are incorporating the cruise missile only on the wings of the B-52G's. We will continue to carry an internal payload of SRAM and gravity weapons. Then, in 1985, when we have nearly completed the wing modifications, we will start modifying the G's to give them an internal ALCM capability.

We have also recommended, although there has been no decision on this yet, to start converting the B-52H into a cruise missile carrier in the 1985 time period or shortly thereafter.

TITAN II

Senator WARNER. Let us conclude the hearing then with the last question relating to Titan II. Will you cover that program and your recommendations for this fiscal year?

General ELLIS. Sir, we have looked at the utilization and the operational requirement for the Titan. We have looked at the maintainability and we have looked at the safety aspect. The Air Force has determined that it is maintainable. It is a safe system. In our SIOP planning it is a very useful weapon, one that will be required until an advanced missile is available.

There are certain funds—I will have to provide the exact number for the record—that will help in terms of safety and maintainability. My memory would indicate it is about \$50 million over the next 3 or 4 years.

[The information follows:]

TITAN II FUNDS

Titan II weapon system safety, reliability and maintainability modifications account for \$16.1 million in the 1981 budget and \$266.8 million in 1982. Some of the major modifications which individually cost over one million dollars are as follows: launch control set modernization, new vapor detection system for each site, propellant transfer system filters and quick disconnect screens, radio type maintenance network improvements, and propellant transfer system spill containment and neutralization programs.

Senator WARNER. Any observations that either of the witnesses wish to make before we terminate the record? We will keep the record open until 5 o'clock for purposes of submission of questions by the members of the committee.

General, I want to thank you and Admiral Carr and your staff for joining us today at the first hearing of a long series of hearings. Senator Jackson and I intend to proceed apace with the objective set by Chairman Tower of covering that material required for our analysis of the authorization sought by the administration.

We further intend to have as many witnesses as necessary to establish a base of information to justify these large expenditures for our strategic system and indeed, if necessary, to look at whatever additional funding may be required. I hope that through your capable staff you will remain acquainted with the work of the subcommittee because I, Senator Jackson, Senator Nunn, and others, value very highly your professional judgment.

I guess to put it bluntly we want as much of it into the record as we can before you decide to take off that suit, whenever that day may come, and enjoy presumably more restful existence. I rather imagine that if you are willing you will be before this committee even in your mufti.

General ELLIS. Thank you, sir.

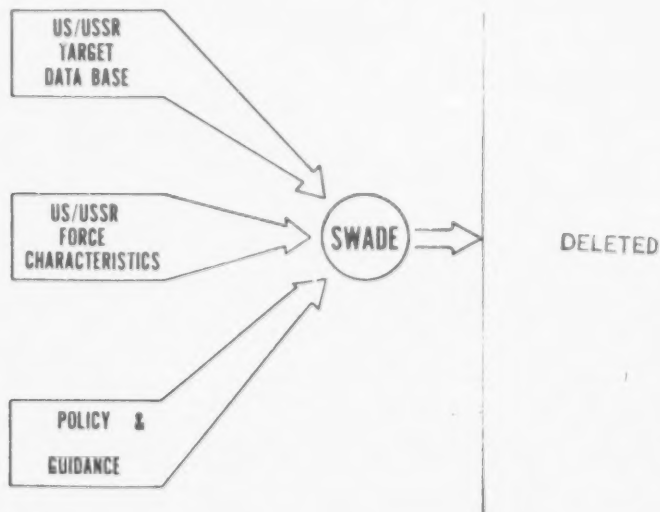
Could I introduce Captain Seiler? If he were a German, he would be Captain Doctor Seiler. He has a doctorate in atomic physics and is one of our premier analysts. I would like to submit his prepared statement for the record.

[The prepared statement of Captain Seiler follows:]

PREPARED STATEMENT OF CAPT. GEORGE J. SEILER, PH. D., ANALYST,
STRATEGIC AIR COMMAND

Mr. Chairman, this short briefing will present the strategic nuclear balance as viewed by the Strategic Air Command and the methodology used in determining that balance. Admiral Carr has described to you the current methodology used in today's SIOP. Our task is to employ that same methodology looking [deleted] into the future.

FIGURE 1



Starting with the current target data base of the Soviet Union the SAC intelligence community projects that data base [deleted] into the future. The projection includes hardening of Soviet command and control centers, missile launch control centers and ICBM silos. Future defenses, such as the SAX-10, are also bedded down. The US target base is the one used by the Joint Chiefs of Staff Studies Analysis and Gaming Agency (JCS/SAGA) to formulate the RISOP—the Soviet corollary of the US SIOP.

We begin with the US forces and characteristics shown to you by Admiral Carr, and then project into the future using the Five Year Defense Plan and those forces planned in the Consolidated Guidance. The planning factors for these forces over the next [deleted] are determined by sophisticated techniques which incorporate the future Soviet defensive threat. For the bomber leg of the Triad, ECM and suppression degrades are incorporated in the probability to penetrate.

The Soviet forces and characteristics are based entirely on the latest National Intelligence Estimate (NIE). We use the [deleted] threat.

The latest policy and guidance available as discussed by Admiral Carr is used both to determine the principles of force employment and the adequacy of those forces once executed.

Static and dynamic measures are used in the analysis. The dynamic interchange uses the computer model SWADE (Strategic Weapon Allocation and Damage Expectancy) developed by SAC for that particular purpose. In the dynamic interchange it is assumed that the Soviet Union initiates the attack using a force allocation similar to that used by the RISOP. The US bomber force is launched on tactical warning and the ICBM force rides out the attack. It is assumed that sufficient C³ survives to execute the forces after a ride out.

For the consequences of execution, we look at installation damage expectancy to the same objectives as the SIOP. The weight of effort by each system of the TRIAD, and the total TRIAD contribution is examined. We also look at those residual forces possessed by both sides following a military exchange and following a military and economic exchange. The military exchange is analogous to [deleted] described by Admiral Carr, while the military and economic exchange is analogous to the [deleted].

Before viewing the 1981 strategic nuclear balance let's review the 1980 balance presented last year.

In the day-to-day alert scenario shown in Figure 2, the pre-hostilities phase for the US represents those on-line available SIOP forces which could be engaged in combat on a moment's notice at the direction of the National Command Authorities (NSA). For a surprise Soviet first strike, our analysis uses the Soviet day-to-day capability commonly used by JCS and OSD.

Figure 2. [Deleted]

Megatonnage is the raw destructive power of a weapon measured as the weapon's yield. Twenty years ago, it was the premier static measure. Equivalent megatons, or EMT, is indicative of a weapon's capability against large area urban targets and is a useful indicator of an "assured destruction" capability. Countermilitary potential, or CMP, incorporates accuracy of the weapon, [deleted] CMP is indicative of a weapons capability against hardened military targets and is a useful indicator of a counterforce capability. [Deleted] also, and numbers of weapons is considered [deleted] according to the Consolidated Guidance.

Although the pre-hostilities phase is important in terms of perception, dynamic interchange is necessary to measure the warfighting capabilities of opposing forces. Dynamic interchange allows the incorporation of actual target data bases, "real world" constraints and expected performance of each weapon system.

As stated earlier, in the military exchange phase, the Soviet Union initiates an attack similar to that used in the Red Integrated Strategic Operational Plan (RISOP) day-to-day scenario. The U.S. retaliates with bombers launched on tactical warning and the intercontinental ballistic missile (ICBM) force riding out the attack. It is assumed throughout this analysis that sufficient command control, communication and intelligence (C³I) systems survive to execute the forces; sufficient tankers are available so that the bomber force is not degraded; there is no technological surprise in terms of Soviet anti-submarine warfare and surface to air missile capability; and the ABM treaty remains in effect. The U.S. response attack against the Soviet military sector includes conventional, nuclear and leadership targets. Weapons programmed for recovery resources

are withheld in this exchange and are reflected for both sides in the residual measures.

It is at this point we examine the post-military attack balance of power in terms of resources and tasks remaining. Resources remaining include the weapons (and their characteristics) programmed for the economic task, [deleted].

The task remaining is represented by the percent of surviving installations relative to the initial target base.

The post-military and economic exchange represents the strategic balance after both sides have executed the forces which were programmed against recovery resources. The U.S. is [deleted]. This task is more commonly referred to as "assured destruction."

The latest guidance tells us that it is important, for the sake of deterrence, to have the capability to deny to the aggressor a favorable shift in the strategic balance as a result of an exchange. This is because the perceived state of the balance following the exchange—both absolutely and relative to pre-hostilities—could be an important factor in the enemy's decision to initiate the exchange.

Further, the potential aggressor should entertain no illusion that by initiating an exchange he could inflict more damage than he would expect to incur in retaliation.

[Deleted.]

Figure 3. [Deleted.]

Today, the Soviets lead the U.S. in all categories of the pre-hostilities phase in the day-to-day alert scenario. The Soviet lead in weapons is primarily because the bulk of their strategic nuclear weapons lies in the ICBM force, which enjoys a high alert status. Following a military counterforce exchange, residual forces show [deleted].

In initiating the attack, the Soviets can destroy [deleted] of the military installations in the US while in retaliation the US can destroy [deleted] of the military installations in the USSR. Residual weapons [deleted] and the military task remaining [deleted]. After a subsequent military and economic exchange, residual resources [deleted] for weapons and much higher in their characteristics, while the remaining tasks in the military sector still [deleted] the Soviets. Note, however, that national guidance for recovery resources [deleted].

Now, let us focus on the resources and tasks remaining following a military exchange and use them to depict the strategic nuclear balance over the past four years, as well as the next ten (Figure 4). We can see that, while our retaliatory capability will [deleted] over the next five years (prior to MX initial operational capability (IOC)), the growing Soviet arsenal will allow a continuing increase in residual weapons and will further stress the strategic balance. The deployment of MX in a survivable basing mode in 1986 [deleted].

Figure 4. [Deleted.]

Figure 5. [Deleted.]

An examination of the 1986 strategic balance (Figure 5) shows about a [deleted] following a military exchange and a [deleted] following a full military and economic exchange—when both weapon residuals and tasks remaining are considered.

Figure 6. [Deleted.]

By 1990 (Figure 6), if MX is fully deployed in survivable basing, the B-52G force has received its full complement of 3,020 air launched cruise missiles (ALCM) and the Trident program remains on schedule, the strategic balance [deleted]. General Ellis will discuss those force improvements which could impact directly on the strategic balance.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER, ANSWERS SUPPLIED BY GENERAL RICHARD H. ELLIS, USAF, COMMANDER-IN-CHIEF, STRATEGIC AIR COMMAND

SAC AND C³

Senator WARNER. What measures in command, control, communications and intelligence does SAC think need to be taken in the next few years?

General ELLIS. As I mentioned in my formal statement, Mr. Chairman, the survivability of strategic forces and command elements, and the resistance of our C³I systems to jamming and exploitation, are critical to the fulfillment of our strategic policy goals. The ability to control our forces and manage them

effectively during protracted conflict requires an enduring, survivable C²I network.

Critical to the decisionmaking process is the exploitation of intelligence and surveillance data. Thus, we need an improved capability to receive, exploit, and apply, the large volumes of intelligence which will become available from advanced collection systems. Near real time access to this information will permit flexible modification of our employment plans. In addition, to fully achieve the required capability for [deleted] we need to pursue initiatives that will allow us to collect strike assessment and other intelligence [deleted] and relay this data to the surviving national command elements in near real time.

We need to apply more resources toward achieving the capability to have data transmitted direct to surviving command elements, thus bypassing vulnerable fixed ground relay and processing stations. To accomplish this, the development of follow-on ballistic missile launch detection systems with on-board processing and cross-linked communications should be accelerated. To close the current radar SLBM launch gaps and provide attack assessment information, two additional PAVE PAWS sites are needed. Also, the development of a survivable atmospheric surveillance system is required to decrease our vulnerability to a precursor bomber and cruise missile attack.

The element which binds command, control, intelligence and forces into a functional, effective warfighting capability is communications. A program such as the Strategic Satellite System, which was not funded, would have fulfilled SAC's requirement for two-way, survivable, secure, enduring communications systems. Failure to deploy this or an equivalent next generation satellite system will seriously jeopardize SAC's ability to effectively manage a modernized force structure.

Senator WARNER. What are the highest priority C²I items?

General ELLIS. SAC's highest priority programs begin with the Post Attack Command Control System—accelerated acquisition of seven E-4B aircraft. The development of a two-way survivable, enduring communications system with the associated SHF/EHF airborne and ground terminals is an absolute necessity which can be realized through a military satellite communications program.

To more effectively employ our Minuteman force, fielding the Airborne Launch Control System Phase III would provide the NCA with greater flexibility and control of the Secure Reserve Force. Two other programs are significant: IONDS, which will provide worldwide intelligence on nuclear detonations; and SACDIN, which is the ongoing upgrade of SAC's command and control data transmission system.

MX ALTERNATIVES

Senator WARNER. General Ellis, you have said that the MX program is of highest priority.

Compared to the Air Force preferred MX/MPS plan, would you comment on: Placing MX in Minuteman silos; placing MX in vertical MPS; defending MX or Minuteman with BMD; defending MX or Minuteman with space lasers; placing MX at sea; launch on warning?

What are your operational concerns about each approach?

General ELLIS. As I have mentioned earlier, Mr. Chairman, the OSD has recently initiated a major review of these options with the goal of presenting the results to the Administration by June 1981. My operational concerns have been identified in previous studies and are as follows:

Placing MX in Minuteman silos would increase the capabilities of our ICBM force but would do nothing to redress our main concern; the lack of survivability of a fixed silo ICBM force. While it is true that those ICBMs which would survive would have greater capability (more reentry vehicles per booster and better accuracy), the expected number of surviving boosters is very low in the post 1985-time period.

There are two major operational disadvantages to the option of placing MX in vertical MPS. First, a vertical system lacks the mobility which can be achieved with a horizontal system. The timelines to remove/replace a missile for maintenance or if necessary to reshuffle it to another silo are approximately five times longer for the vertical system. Secondly, the Ballistic Missile Office of the Air Force Systems Command informs me that they would anticipate an initial operational capability delay of approximately one year if they had to redirect their efforts to the vertical basing mode. This is due primarily to having to reaccomplish the System Design Review and renegotiate contracts for a vertical

system plus having to revise or supplement the Environmental Impact Statement to properly describe the system.

Defense of the Minuteman system is not a very attractive option. While such a system could provide sizable numbers of surviving reentry vehicles, the cost would be staggering and the technical risk great. Additionally, the surviving reentry vehicles would lack the required capability to destroy the increasingly hard Soviet ICBM silos.

Defending MX with ballistic missile defense (BMD) may become an attractive option depending upon the Soviet threat. While MX in the baseline multiple protective shelter basing mode will be adapted to provide adequate survivability, we must weigh the options of adding more MX missiles, adding more shelters, adding BMD or a combination of these. Previous studies indicate that BMD may be the most cost effective. This presumes that the BMD development goes as planned and the estimated costs are correct.

The concept of defending MX and Minuteman with space lasers seems promising for the future and I fully support the technology which would make this possible. However, it appears that this capability is too far down stream to redress the problems of ICBM survivability during the 1980's and early 1990's.

There are two frequently discussed proposals for putting MX to sea. The first is the Shallow Underwater Mobile (SUM) concept where 2-4 missiles are carried in canisters external to small submarines. Studies done by OSD and the Navy indicate that this system would be more costly and could not be achieved as fast as the baseline MX system. Further, it would have a detrimental effect on the Triad and since our ICBMs are already in jeopardy, the Soviets could then devote their major technology efforts to detection and defeat of the SLBM leg. Given enough time and resources, I feel certain they might succeed. The second proposal calls for deploying ICBMs on surface ships. They would either be launched from the ship or dropped into the sea to be launched at a later time. I find this proposal difficult to accept for several reasons. Surface ships are not survivable in a nuclear conflict. Therefore, survivability of this system would depend totally on tactical warning. If the missiles were dropped at sea, I envision major command control problems. If left at sea for extended periods, unattended missiles with nuclear warheads would provide a hazard to navigation plus be a lucrative target for third world nations or terrorists groups.

Launch on warning is an option we have and must maintain. It remains a useful option because the enemy cannot be certain it will not be used or know the conditions under which it would be used . . . and, therefore, he must always make it a part of his planning deliberations. However, to make this tactic our primary or sole option would create the most destabilizing situation I can think of—one in which our national leaders would be forced into a "use-or-lose" situation with a major strategic weapon system, a weapon system which cannot be recalled once launched regardless of circumstances. Therefore, I must reiterate my view that launch on warning must never become a substitute for a survivable ICBM force.

NEED FOR MORE WEAPONS

Senator WARNER. General Ellis, some people say that the U.S. and the U.S.S.R. have so many nuclear weapons that a nuclear exchange would result in "over-kill" of each nation's population many times over. Why do we need more weapons survivable?

General ELLIS. Mr. Chairman, the key element in your question concerns weapons survivability. In the day-to-day alert posture, about [deleted] targeted in the Soviet Union are available to the National Command Authorities (NCA). If the Soviets were to initiate a nuclear war—and the ICBM force rode out that attack—about [deleted] alert weapons would survive. These surviving weapons must then be able to penetrate Soviet airspace and strike their targets. If the NCA responded with our largest attack against the Soviet military [deleted] weapons would actually arrive and detonate on Soviet military targets.

Our calculations show that if we build survivable systems and if the Soviet threat does not increase significantly, then in the day-to-day scenario, we require about [deleted] to do the job. An [deleted] arriving weapons are necessary to be employed against Soviet [deleted] to satisfy national guidance. Today, we are about [deleted] against the Soviet military sector.

There are two ways to achieve the required number of arriving weapons: build a large arsenal of low quality, low survivability weapons; or build quality, surviving systems which do not require large arsenals to guarantee our require-

ments. SAC's proposals for the MX in survivable basing and the New Technology Bomber can satisfy those requirements without huge arsenals.

UPGRADE B-52'S FOR RDF

Senator WARNER. General Ellis, does SAC have a plan for upgrading existing B-52's for the Rapid Deployment Force? Is that plan properly funded in the fiscal year 1982 budget?

General ELLIS. Mr. Chairman, the SAC plan was presented to OSD in January 1980 to upgrade 35 B-52H's as part of the Strategic Projection Force. Currently, the B-52H can be configured to carry 27 500-pound conventional bombs. The proposed modification would add the capability to carry an additional 81 weapons for a total of 108 bombs. In addition, we have proposed a Laser Ranger be added to the existing Electro-Optical Viewing System (EVS) to improve weapon delivery accuracy. The Laser Ranger—EVS configuration would be integrated with the new offensive avionics system that will be installed on the B-52H beginning in fiscal year 1982.

The modifications recommended by SAC and approved by the Air Staff were not funded in the fiscal year 1982 President's Budget. However, if approved, the proposed fiscal year 1981 supplemental and fiscal year 1982 amendment will provide enough funds to start the program. At this time, I believe \$32 million of the approximately \$100 million required is being requested.

ROLE FOR SLCM

Senator WARNER. What role do you see for the Sea-Launched Cruise Missile in support of SAC missions?

General ELLIS. The Sea Launched Cruise Missile (SLCM) appears to have limited utility in direct support of SIOP mission due to the difficulty of keeping the boats in position at all times. Also it does not appear wise to tie up Submarine Launched Ballistic Missile boats with SLCM's, nor to deploy SLCM on vulnerable surface ships.

NEAR-TERM IMPROVEMENT ALTERNATIVES

Senator WARNER. Of the near-term improvement alternatives you provided to this committee last year, which seem most desirable to you as an operational commander? Have the cost figures for these alternatives changed over the past year and if so, to what extent?

General ELLIS. Mr. Chairman, my position has not changed over the last two years—but the cost has. The FB-111B/C, in my assessment, offers the earliest increase in capability while not precluding long-term requirements for a new technology bomber. Last year the Air Force System Command's cost estimate for 150 FB-111B/C aircraft was shown as \$7.0 billion. That cost is now \$7.7 billion in 1981 dollars.

SUPPORT MINUTEMAN IMPROVEMENTS

Senator WARNER. Do you, General Ellis, support in principle the idea of modifying and upgrading our Minuteman force in ways aimed at increasing the effectiveness of surviving warheads, even though improved Soviet accuracies are reducing the probable size of that surviving force?

General ELLIS. Yes, Mr. Chairman, we must continue to improve the effectiveness of our Minuteman force despite its decline in survivability. We need near-term improvements because Minuteman is presently our only system with a quick hard target capability. We need far-term improvements to insure that Minuteman continues as a credible, usable system.

While Minuteman's survivability in a full ride-out scenario is declining and steps must be taken to remedy this situation, there remain other scenarios where Minuteman's utility will remain quite high. The Minuteman system, with its varied composition of reentry vehicles, is uniquely suited for application in the early stages of a conflict. Minuteman II is the primary single reentry vehicle weapon system capable of rapid response in a limited scenario. Where smaller yield weapons are desired, Minuteman III, with three weapons, can be more efficiently utilized than its more fractionated MIRV counterparts.

There are other reasons for continuing to improve the Minuteman force. The survivability of the MX weapon system is directly related to the number of

Minuteman deployed and the Soviet's targeting philosophy. We believe the Soviets now have no choice but to target Minuteman first, using remaining weapons to attack MX. If the Minuteman capability is allowed to decline, we risk a change in Soviet targeting philosophy that could leave the US with surviving Minuteman weapons that are incapable of accomplishing the needed task. We cannot tolerate such a situation.

REPLACE MM II WITH MM III

Senator WARNER. General Ellis, what is your personal, professional opinion on the idea of replacing 100 Minuteman II missiles with Minuteman III's? You will recall that this committee authorized \$10.4 million for that purpose last year.

General ELLIS. Mr. Chairman, I support the proposal to the extent of deploying 50 additional Minuteman III's. This additional deployment is the most visible, near-term strategic force improvement option available to the United States. The perceptual significance must not be overlooked. It would clearly demonstrate our resolve to redress the current nuclear imbalance.

The deployment of 50 rather than 100 additional Minuteman III would more evenly distribute remaining test assets and allow us to continue our flight test program well into the future. This is important as flight testing is the only way to determine accuracies and is the principal means in determining deployed force reliabilities.

Two points must be remembered, however. First, the deployment of 50 additional Minuteman III's does not solve our long-term ICBM survivability problem. MX provides that capability. Second, while the direction of future strategic arms negotiations is unclear, this deployment would increase our total MIRV count. Any future negotiations should take this into account.

STATUS OF ALCS UPGRADE

Senator WARNER. Last year you testified that the Air Launched Control System (ALCS) Phase III was a good program and that SAC recommended that all 1,000 Minuteman launch facilities be equipped with it. This committee authorized \$5 million for R&D required in fiscal year 1981 in support of this program. Can you tell us where we stand on the ALCS upgrade and has your support for retrofitting all Minuteman facilities with it changed?

General ELLIS. The ALCS Phase III program for 200 Minuteman III facilities is progressing satisfactorily. Preliminary hardware and software designs have been formalized and first aircraft modification is now scheduled for March 1984. Further conceptual work on the expanded Phase III program has shown that, although desirable, it is not cost effective to retrofit the 150 Minuteman II facilities at Ellsworth AFB, S. Dak., unless they are also upgraded to include remote retargeting capability. Therefore, the \$5 million R&D funding is being used to scope and cost a Phase III program for the remaining 350 Minuteman III and 300 Minuteman II facilities and the aircraft in the existing ALCS.

EXTENDED SURVIVABLE POWER PROGRAM

Senator WARNER. What is the status of the Extended Survivable Power Program? Is it on track and adequately funded?

General ELLIS. In 1976, SAC requested increased endurance for Minuteman launch facilities and launch control centers. Lithium batteries were identified as the best way to meet this requirement. The fiscal year 1981 Defense Appropriation bill included \$24.7M to procure and install these batteries in 550 Minuteman III launch facilities. While funding priorities resulted in the deletion of the extended power program from the original fiscal year 1982 budget submission, the fiscal year 1982 amended budget request does include \$45.0M to continue this effort—leading to an initial operational capability of May 1983.

HAVE STRATEGIC SLCM AVAILABLE

Senator WARNER. General Ellis, from a targeting and operational point of view, would you like to have available to you strategic mission-dedicated sea-launched cruise missiles?

General ELLIS. From a targeting standpoint, Mr. Chairman, the addition of sea-launched cruise missiles on a survivable platform would be desirable. The

addition of a highly penetrable, accurate, hard target kill capability would be beneficial to the strategic war plan.

However, I think the Navy would take exception to the operational constraints on Nuclear Attack Submarines used in such a role. If SSN's were SLCM equipped and committed to a SIOP role, their other operations would be seriously degraded. If a submarine were procured that was specifically designed to launch only SLCM's, it could be dedicated to a SIOP role.

COMPARE U.S.-SOVIET AIR DEFENSE CAPABILITIES

Senator WARNER. In the early 1970's, the notion was accepted that, since we weren't going to defend ourselves against ICBMs (ABM treaty), it made little sense to defense against bombers either. As a result of this decision, strategic air defense has been relegated to the Tactical Air Command (TAC) as an ancillary mission. This mission has consequently suffered from inadequate resources, modernization and official attention. Recent incursions into US air defense zones by Soviet aircraft have pointed up our deficiencies in this area.

How would you compare US abilities to thwart a Soviet air strike with Soviet air defense capabilities against a comparable US strike?

General ELLIS. The reorganization of USAF air defense and surveillance/warning resources which occurred on Oct. 1, 1979 transferred resource management responsibility for atmospheric defense forces to the Tactical Air Command (TAC). As the resource manager, TAC has the responsibility to organize, train, equip, administer, and maintain combat ready air defense forces and to provide these forces for Cincnorad/Cincad operational control. The responsibility for the strategic air defense of the United States and North America remains with Cincnorad/Cincad, and was not relegated to TAC as an ancillary mission.

Other than the previously approved conversion of military long range radars, no reduction in air defense forces has taken place since the reorganization except for the release of approximately 760 manpower positions directly associated with the reorganization and subsequent elimination of the Air Force Major Air Command Headquarters. Since the time when the resources were transferred to TAC, one Air National Guard F-101 squadron has begun its conversion to F-4 aircraft, and the date for formation of the first strategic air defense F-15 fighter interceptor squadron has been accelerated from [deleted] to [deleted].

The air defense system for North America today consists of the Distant Early Warning line, the Cadin-Pinetree line, the Alaska radar net of 13 sites, and the 46 Conus periphery radars of the USAF/FAA Joint Surveillance System. Seven AWACS aircraft are designated for NORAD use by the JCS. Active defense is provided by less than 400 dedicated U.S. and Canadian air defense fighter interceptor aircraft. There are no U.S. Army surface-to-air missile units dedicated to NORAD during peacetime.

Our air defense surveillance, warning and active defense capabilities are extremely limited. [Deleted.]

[Deleted.] Peacetime control of access to U.S. and Canadian airspace against low level intruders approaching from any direction is extremely limited.

The Soviets have not chosen the same course for defense of their homeland as has the United States. They currently have over [deleted] surface-to-air missile (SAM) sites with some [deleted] SAM launchers. Located at Moscow, in addition to SAMs, is an antiballistic missile (ABM) system comprising 32 missiles. Furthermore, there are about 2600 air defense interceptor aircraft assigned to homeland air defense. The entire air defense force is supported by over [deleted] early warning/ground control intercept radars and [deleted] related radars.

An attack on the Soviet homeland would therefore face an extensive, integrated air defense force. However, United States planning for execution of our Triad takes into account the Soviet air defense capabilities. The mixed force of ICBM's, SLBM's, and, in the future, air launched cruise missiles, will serve both to reduce the strength of the Soviet defense and seriously degrade the effectiveness of the remaining forces. Penetrating bombers would then use defense avoidance and active countermeasures to evade and counter the remaining defenders.

AIR DEFENSE INTERCEPTORS

Senator WARNER. Last year in response to a question on this point, the Air Force informed the committee that we had 381 dedicated aircraft assigned to the air defense fighter/interceptor mission—the bulk of them aging F-101's and

F-106's. Has that number changed dramatically in the past year and how does it correspond to Soviet air defense forces in numbers and age of equipment?

General ELLIS. There were no programming actions during the past years affecting the number of dedicated air defense fighter interceptor aircraft. Six aircraft were destroyed in Class A mishaps, reducing the number of backup aircraft available. The total number of primary authorized aircraft remained constant.

The Soviet Union currently has approximately 2,600 air defense fighter interceptor aircraft which have been operational an average of only eight years. These fighters vary from the Fishpot B/C which average 21 years old to new Flogger models which have been operational less than two years.

REQUIREMENTS FOR AIR DEFENSE MISSION

Senator WARNER. In your personal, professional opinion, how many and what types of modern aircraft should be dedicated to the air defense mission?

General ELLIS. The Strategic Defense fighter forces do need to be modernized to keep pace with the increasing threat from the Soviet Long Range Aviation (LRA) forces. The USAF Air Defense Master Plan outlines the Air Force recommendation for such modernization. Basically, it calls for a one-for-one conversion of the active duty F-106's with F-15's. The Air National Guard, F-106's will be modernized with either F-4's, F-16's, or F-15's, depending upon availability.

SOVIET AIR DEFENSE CAPABILITIES

Senator WARNER. General Ellis, can you give the committee any further information about changes in Soviet air defense capabilities over the past year? Has the new SA-X-10 become operational? How do you regard the SA-X-10's ability to counter current generation ALCM's? Has the Soviet look-down/shoot-down capability featuring [deleted] completed development testing?

General ELLIS. The Soviets have made across-the-board improvements in their air defense during the past year. Mr. Chairman. They have continued to deploy late-model interceptors such as the Flogger G, whose airborne radars give them a much improved low altitude intercept capability. They are [deleted]. Their low altitude capability has been further enhanced [deleted]. All these systems employ the latest radar and electronic counter countermeasure technology [deleted]. As a balance to the various low-altitude improvements, the SA-5, a long-range, medium-to-high altitude system, is continuing to deploy.

[Deleted.]

REQUIREMENT FOR BMD SYSTEM

Senator WARNER. As you know, anti-ballistic missile systems have been the subject of considerable and growing interest in recent years. This is due to several factors. The development of more promising ABM technologies; the relatively sudden appearance of high accuracy Soviet ICBM systems; and escalation of the MX basing and sizing controversy. The BMD program is administered by the Army but, if deployed to defend ICBM silos, would come under SAC's jurisdiction.

General Ellis, leaving aside political considerations, is there an operational requirement at this time for a deployed BMD system?

Do you envision such a requirement developing in the next two, five or ten years?

General ELLIS. The survivability of our ground-based ICBM's is declining as Soviet ICBM accuracy increases. The MX in the multiple protective shelter basing mode, is being developed to counter this problem. Depending upon the threat, the MX will be adapted to provide adequate survivability. This could be achieved by proliferating the number of MX missiles or shelters, deploying an ABM system or a combination of the three.

The requirement for ACM deployment, both now and for the future, is still a matter of study. However, considering potential Soviet threat capabilities, ABM technology and development should continue to be pursued.

SOVIET ABM R. & D.

Senator WARNER. Do you regard Soviet research and development efforts in the ABM field as being designed to support or, indeed, lead to, a break-out capability?

How would you characterize Soviet abilities to field quickly a workable ABM system? In your opinion, could the SA-X-10 perform in the ABM mode?

General ELLIS. Since your two questions are so interrelated, Mr. Chairman, permit me to answer them together. The Soviets currently have an operational ABM systems deployed around Moscow. They have had an [deleted] and presently have [deleted] that are ABM related. With continuing R. & D. [deleted]. If they chose to breakout, they could deploy some [deleted]. There is no evidence at this time to indicate that [deleted].

Soviet SAM systems—those currently deployed or under development—are assessed as having [deleted].

BUILT-IN ERROR IN ANALYSIS

Senator WARNER. General Ellis, your analysis of the future strategic balance is based upon the actual Five-Year Plan for strategic programs. Historically, the Five-Year Plans have proven to be too optimistic, with U.S. programs funded being less than planned. Doesn't this give you a built-in error in your analysis which implies that the future balance will actually be worse than you project?

General ELLIS. Historically, Mr. Chairman, the Soviet Union has [deleted]. Given these factors, there is a possibility that the imbalance could become more severe. However, I am optimistic that with a new realization of Soviet direction and capability coupled with the dedication by the Administration to correct the strategic imbalance, U.S. planned force levels can and will be achieved.

BACK-UP FOR CRITICAL C³ SYSTEMS

Senator WARNER. General Ellis, last year Dr. Perry testified that it was then too early to tell the degree to which back-up systems for critical strategic C³ facilities such as the Satellite Control Facility at Sunnyvale, could be accelerated to provide a relatively near-term IOC. Can you tell us your thoughts on programs which, if adequately funded now could provide some system redundancy in the near future?

General ELLIS. Mr. Chairman, the Air Force is pressing for a Consolidated Space Operations Center (CSOC), which would eliminate the single failure nodes for both the Satellite Control Facility (SCF) and the space shuttle. Unfortunately, the CSOC will not even have a minimum capability until 1986. There is little we can do before then regardless of funding due to development and procurement times. I would stress that funding be maintained to insure a CSOC IOC of 1986.

The CSOC will provide a peacetime backup to the SCF, but it will not provide wartime capability. As space systems become increasingly important to warfighting capability, satellites must be made more autonomous to increase survivability and endurance. In addition to satellite survivability, emphasis should be placed on the survivability and endurance of terminals and communications links—today, the most vulnerable element of space systems.

ENDURING STRATEGIC C³

Senator WARNER. General Ellis, has there been any progress in the past year in implementing the recommendations put forward by the JCS and CNO's connectivity studies and the DSB's task force on enduring strategic C³ such that we now have a C³ structure more capable of enduring through a nuclear conflict relative to last year at this time?

General ELLIS. No, Mr. Chairman, the C³ structure is no more capable of enduring today than it was at this time last year.

Many of the recommendations are in various stages of implementation. Some procedural improvements have been made and we now have one operational E-4B plus 50 percent of SAC's bombers have satellite communication terminals; however, little overall improvement to strategic connectivity has materialized to date. Increased national attention and emphasis is required on this most important issue.

LEVELS OF FUNDING NECESSARY

Senator WARNER. General Ellis, what levels of funding beyond those presently programed are necessary to implement these recommendations?

General ELLIS. As I stated previously, many of the over 100 recommendations of the JCS Connectivity study are in various stages of implementation. Some of the recommendations were procedural and cost very little to implement. Many programs are currently being costed after careful evaluation of their individual contribution to overall connectivity. Systems to support assured connectivity

have been recommended and aggressively sought but still have not been funded. An example was the Strategic Satellite System estimated at \$2.5 billion. To repeat, significant increases in funding must be obtained to correct deficiencies in strategic connectivity.

ADDITIONAL PAVE PAWS SITES

Senator WARNER. General Ellis, last year you stressed the need for two additional PAVE PAWS sites—one in the Southeast and a second in the Southwest to close gaps in our current SLBM warning radar. As an operational commander, how high a priority do you attach to closing those gaps and at what level would you feel these additional facilities should be funded?

General ELLIS. Mr. Chairman, following the technology development effort toward a future space-based warning and assessment system, closing those radar gaps should have the highest priority in strategic defense. The coverage of the two new PAVE PAWS radars will increase confidence in detecting sea-launched ballistic missiles launched from the South, Southwest and Southeast as well as provide the only detailed attack assessment capability from these areas. Development and construction should proceed as soon as possible, since delay would result in cost increases and a loss of industry manpower with direct PAVE PAWS experience. Timely action on the Southeast radar will avoid the necessity of costly modification to the Eglin FPS-85 and MacDill FSS-7 radars and will allow closure of these facilities once the new PAVE PAWS site is operational. These new PAVE PAWS sites should be fully funded.

FALSE ALARMS

Senator WARNER. General Ellis, last year, as you know, two members of this subcommittee, Senators Hart and Goldwater, conducted an investigation of the recent "false alarms" of the strategic warning system. Are you familiar with their report and, most particularly, with its conclusion and recommendation section?

General ELLIS. Yes, Mr. Chairman, I am and I agree that the missile attack warning system is an extremely critical part of the defense structure of this country. As you know, the report asks the Secretary of Defense to study warning function with the objective of consolidating essential resource management under one commander. I understand the response by the Secretary is forthcoming this March.

I support the recommendation that Automatic Data Processing Equipment for the missile warning mission be exempt from the procurement procedures mandated by General Services Administration. As you may know, these procedures are very complex and often not responsive to national requirements.

AGREE WITH FINDING

Senator WARNER. General Ellis, do you agree with their finding that the process whereby automatic data processing equipment is procured imposes delays and technical obsolescence when updating and modernization of the strategic warning system is undertaken?

General ELLIS. Yes, Mr. Chairman, I agree. There has been a massive body of administrative regulations which has evolved since the passage of the original Brooks bill in 1965. In the technological explosion which has characterized the ADP and telecommunications industry in the last 15 years, GSA's federal procurement regulations, OMB circulars and bulletins, as well as Agency administrative regulations and practices have become so convoluted as to completely usurp the original intent of the Brooks bill. This, in turn, has stifled the ability of all Federal agencies, not just DOD, to capitalize on electronic technology. I submit that we in the Federal Government must turn this around and suggest this as a fruitful area to begin the President's deregulatory movement.

ADPE PROCUREMENT PROCESS

Senator WARNER. General Ellis, do you have any thoughts for the record on ways in which the ADPE procurement process for critical mission areas such as strategic warning may be streamlined?

General ELLIS. Mr. Chairman, as you know, the Brooks bill gives the General Services Administration (GSA) the responsibility for regulating Federal Automated Data Processing (ADP) acquisition. Since passage of this law, the growth

of data processing technology has been phenomenal and the use of computers in the military has expanded into the critical areas of strategic warning, attack assessment, war planning, intelligence and command and control versus the traditional recordkeeping functions of the mid-1960s. The Department of Defense in early January of this year requested from GSA as general Delegation of Procurement Authority for essential strategic, tactical and direct mission support computers. This request initially came from me with the Secretary of the Air Force's approval. It was broadened into a DOD request. The Office of the Secretary of Defense is still working to convince GSA that this Delegation is warranted.

ROLE OF TITAN II

Senator WARNER. General Ellis, what role does the Titan II Missile play in our strategic targeting planning today?

General ELLIS. Mr. Chairman, Titan's [deleted] warhead is designed for and effective against wide area, soft targets. Titan targets are specifically constructed high-yield aggregate Desired Ground Zeros (DGZ's) which contain more than one primary DGZ. The 52 Titan weapons presently cover [deleted]. Each of these primary DGZ's could require [deleted] to provide damage levels equivalent to those achieved by Titan.

TITAN II PROBLEMS

Senator WARNER. To what degree are the problems being experienced with the Titan II force simply ones endemic to an obsolescing, liquid-fueled system which no amount of additional precautions and maintenance attention can fully correct?

General ELLIS. After the accident of Damascus, Arkansas last fall, Mr. Chairman, the Secretary of the Air Force formed a review group under General Davis to assess the safety and supportability of the Titan system. The review group found that the system would remain safe and supportable into the foreseeable future. I concur with that finding. Although the system is aging, it has not become unreliable or inherently unsafe. With adequate maintenance and adherence to established safety precautions, the Titan system can be kept safe and operable.

IMPLICATIONS OF TITAN II PHASE OUT

Senator WARNER. General Ellis, what are the implications of a phase out of these missiles for our ability to carry out the strategic mission?

General ELLIS. Titan II plays a useful role in current war plans, Mr. Chairman. As I explained previously, the 52 Titans in the current strategic war plan cover hundreds of DGZ's. Decommissioning Titan without replacement would [deleted] a complete reallocation of other nuclear forces. To continue to achieve current damage levels, operational planners would have to reallocate approximately [deleted] weapons.

With regard to deterrence perceptions, Titan II contributes [deleted] of the total megatonnage of the our day-to-day alert forces.

Decommissioning Titan II without replacement or without integrating its phase-out into the arms control process would likely be interpreted abroad by friends and foes alike as a lessening of U.S. resolve.

OFFSET THROW WEIGHT REDUCTIONS

Senator WARNER. General Ellis, to what degree can throw weight reductions thus incurred be offset before the MX comes on line by increased deployments of Minuteman III's and larger yield warheads?

General ELLIS. Mr. Chairman, there is no near-term alternative that will totally offset the capability lost from dismantling Titan II. This table contains near-term options and illustrates their impact upon total ICBM force megatons.

Alternative	Yield (MT)	Change
Total current ICBM force including Titan II:		
1. Replace Titan with 50 MM II w/1 MK 11C in Titan silos and deploy 50 additional MK. III in MM II silos.	[Deleted.]	
2. Replace Titan with 50 MM III w/2 MK 12's in Titan silos.		
3. Reconf 550 MM III w/3 MK 12A's		
4. Deploy an additional 50 MM III w/3 MK 12's in MM II silos (600 MM III deployed).		

B-52 MOD FUNDING

Senator WARNER. General Ellis, last year you testified that the Executive Branch and the Congress had failed to fund adequately the B-52 mods program in order to allow these aircraft to perform the penetrating bomber mission in the mid-80's. Has that situation changed to your satisfaction?

General ELLIS. Several major modifications required to enhance the B-52's capability to penetrate in the mid-1980s remain unfunded, Mr. Chairman. While SAC's intent is to transition all the B-52G and H aircraft into the standoff cruise missile carrier role when the B-52 is no longer a viable penetrator, some of these modifications remain essential for survival in the standoff role. Funds for these modifications and full B-52G/H cruise missile integration remain inadequate.

ADDITIONAL B-52 MODIFICATION PROGRAMS

Senator WARNER. General Ellis, what additional modification programs remain un- or underfunded? In what ways could additional funding be usefully spent to permit acceleration of the mod and up-grade program, resulting in earlier improved capabilities for the B-52?

General ELLIS. Mr. Chairman, the funds requested in the FY81 supplemental and the FY82 amendment, if approved, adequately fund modifications required for the B-52s cruise missile carrier role. To answer the second portion of your question, there are four categories in which additional funds could be used to accelerate programs or improve B-52 capabilities consistent with our recommended transition to a cruise missile carrier.

First, we need modification funds to deploy cruise missiles on the B-52H. Presently, we protect this option with research, development, test and evaluation funds. Second, additional funds are required to update existing ECM/Defensive Avionics to support the cruise missile carrier role. Third, sub-system improvement modifications for the B-52 could be accelerated. These modifications, although providing improved capabilities by virtue of advanced technology, primarily redress reliability and supportability problems. While current schedules are designed to meet dates when systems become unsupportable, program acceleration would reduce total support cost, aircraft downtime and save on spares investment. Fourth, additional money could support accelerated cruise missile deployment on the B-52G and H. Acceleration of the B-52G internal modification and the B-52H option would require an accelerated missile procurement and would impact the MIRV limit under the proposed SALT Treaty. Accelerated withdrawal of the B-52 from the penetration role must be compatible with deployment of the new bomber. Our studies continue to indicate that a mixed force of penetrators and cruise missile carriers offers the most effective force.

FUTURE B-52 ROLE

Senator WARNER. General Ellis, what role do you see for the B-52's in the future should funds be sought, approved and spent for a new manned Penetrating bomber? To what degree are the upgrades envisioned in the B-52 mod program duplicative and wasteful if a new penetrator is authorized?

General ELLIS. Mr. Chairman, the cruise missile carrier role that SAC has recommended as the primary mission for the B-52, although not totally dependent on deployment of a new penetrating bomber, is completely consistent with that objective. For several years, the upgrades, proposed as part of the B-52 modification program, have been geared for transition to the cruise missile carrier role. Last year in response to a growing national concern over a lack of rapidly deployable firepower, SAC recommended an expanded conventional role for the B-52H. The majority of ongoing and programed B-52 modifications support the cruise missile carrier role; however, a limited number of requested modifications support the expanded B-52H conventional mission recommended by SAC. None of the modifications requested by SAC would be duplicated by a decision to procure a new bomber.

KC-135 REENGINEING/REALIZE SAVINGS

Senator WARNER. General Ellis, do you feel confident that the substantial up-front costs entailed in the KC-135 reengining program will be offset by savings realized in future operating costs?

General ELLIS. Yes, Mr. Chairman, I do. Air Force Studies and Analysis has demonstrated that the 20-year life cycle costs to maintain the current fleet is \$52.4 billion. On the other hand, the study showed that the cost for reengining 600 aircraft and fleet operation would be only \$45.6 billion. The acquisition cost of approximately \$9 billion would be offset by a \$2 billion savings in O&S costs, a \$12 billion fuel cost savings, and \$1 billion in alert costs. The net result would be a cost avoidance of approximately \$14 billion over the next 20 years, which more than offsets the acquisition cost.

KC-135 REENGINEING IN COMPETITION WITH KC-10

Senator WARNER. General Ellis, do you see the KC-135 reengining program as being in competition with the KC-10 for the air-refueling mission? What do you envision as being the optimal composition of the air-refueling component of the Strategic Air Command's forces?

General ELLIS. Mr. Chairman, I do not view the KC-10 and KC-135 reengining programs as being in competition with one another. Each aircraft brings an advantage not offered by the other. The KC-10 and KC-135 reengining are complementary programs for resolving our tanker shortfall.

Both the KC-10 and KC-135RE offer improved offload capability. The KC-10 provides a long range deployment capability desperately needed by the General Purpose Forces. It is refuelable, and it has a significant cargo capacity. The KC-10, however, is an off-the-shelf aircraft which, [deleted] for the SIOP mission. Additionally, the KC-10 does not resolve the operational and environmental deficiencies associated with the current KC-135 J-57 engine.

The KC-135RE, [deleted] serves both the SIOP and General Purpose Forces. Although it has neither the range nor cargo capability of the KC-10, the KC-135RE does resolve the J-57 engine problems, and it is the only near term alternative which supports the [deleted].

Maximum operational benefit is derived from a force mix. I believe it is critical that we reengine the entire KC-135 fleet to improve our SIOP capability. Concerning the KC-10, [deleted]. The KC-10 is also an excellent match against the C-5 airlift mission. As the RDJTF expands and as airlift requirements increase (e.g., addition of C-X), more KC-10's may be needed.

STRATEGIC [DELETED] IMPORTANCE OF SPACE SHUTTLE

Senator WARNER. SAC is dependent upon [deleted] and aircraft reconnaissance for its strategic target planning. Many of our satellite resources will be heavily dependent on the space shuttle which has experienced delays and many of our aircraft (U-2's and SR-71's are getting old. General Ellis, how important do you see the space shuttle to your mission?

General ELLIS. Mr. Chairman, it is vital that the U.S. maintain a viable space launch system capable of sustaining national defense space assets. The space shuttle was developed as an economical space transport system to be operated during peacetime. As such, it will be utilized to the maximum extent possible. An additional consideration is the military need for a responsive launch capability to replenish our vital national defense satellites lost to natural or hostile attrition. What we must begin to address is how to maintain DOD satellite operations during periods of hostilities. If we are to maintain an enduring space network, I believe a reassessment of our approach to satellite system design and transport may be in order. The use of the space shuttle will play a vital part in this assessment, as will alternatives such as expendable launch vehicles.

IMPROVEMENTS IN STRATEGIC RECONNAISSANCE AIRCRAFT

Senator WARNER. General Ellis, what kind of improvements would you like to see in our force of strategic reconnaissance aircraft such as the SR-71 and the U-2?

General ELLIS. Mr. Chairman, [deleted] at any level of conflict, the SR-71, U-2 and KC-135 programs rank high on our list of required improvements. For example, we need: numerical increase in force structure; acceleration of modernization, sensor and electronic counter measures (ECM) programs; and development of an advanced data transmission system.

[Deleted] augments our reconnaissance capability to meet our requirements. The U-2 and SR-71 will soon field [deleted] well into the 1990's. Continuing

ECM Research and Development (R&D) ensures these assets can collect in a peripheral or penetrating mode with high probability of survival. Initiatives in our current budget submission include development of a [deleted]. This capability will reduce the time from collection to reporting by an order of magnitude and possibly reduce the number of expensive ground processing facilities now envisioned.

Regarding the RC-135, I again stress the importance of fully modernizing all Rivet Joint aircraft. This modernization program is absolutely essential to insure that we have the capability to [deleted]. Programed R&D initiatives address critical [deleted]. Similarly, there is a need to improve Rivet Joint tactical communications. An anti-jam, multi-channel ultra-high frequency satellite capability would ensure a continuous flow of real time, [deleted].

These improvements will not stress technology although they will require a significant fiscal commitment. The payoff—a totally responsive reconnaissance capability—is worth it.

QUESTIONS SUBMITTED BY SENATOR SAM NUNN, ANSWERS SUPPLIED BY GENERAL RICHARD H. ELLIS, USAF, COMMANDER-IN-CHIEF, STRATEGIC AIR COMMAND

B-52 BASES/STAGING

Senator NUNN. What are the requirements and advantages in being able to use base facilities in [deleted] for B-52 missions? What types of operations would be flown from these areas and how important is access? What are the current problems, if any, in respect to these areas? What is the status of negotiations related to the [deleted] facility and what role and input has SAC had in this process?

General ELLIS. Because of geographic proximity, the Soviet Union possesses regional conventional military superiority and the ability to employ armed forces faster than the U.S. and our allies in many regions important to our security interests. Senator, I believe it is imperative for us to find better ways to offset and lessen Soviet geostrategic advantages.

With staging bases [deleted] close to [deleted] our Strategic Projection force with its 28 B-52H's can deliver up to 200 tons of explosives per day; thus, providing timely and effective assistance to disrupt enemy actions very early in any invasion. No other weapon system can match the B-52 in delivering concentrated conventional firepower on the battlefield. We need to make [deleted] viable staging bases by developing political arrangements and identifying funding to upgrade certain facilities as well as prepositioning war reserve material, munitions, and petroleum, oil, and lubricants (POL).

We propose to fly our [deleted] because of reduced flying time and reduced requirements for air refueling support. In addition, this initiative would display U.S. presence in another important part of the world. The [deleted]. Our role in this staging process has been to develop the military requirements necessary for operating B-52's, on a limited scale, through that [deleted] facility.

SOVIET ICBMS

Senator NUNN. What improvements and capabilities are estimated or predicted for the Soviet Fifth generation ICBMs that you mention in your statement are under development?

General ELLIS. Senator Nunn, these Soviet Fifth Generation ICBM's will incorporate [deleted]. These are the results expected from advancements in key technologies such as [deleted].

NAVAL MISSIONS

Senator NUNN. General Ellis, what role can or should SAC play in respect to maritime missions to assist the U.S. Navy? Do you think that Air Force capabilities should be included when calculating the U.S.-Soviet naval balance of power?

General ELLIS. Senator Nunn, SAC has been tasked by the Joint Chiefs of Staff Joint Strategic Capabilities Plan to perform three collateral missions: aerial minelaying, conducting antisubmarine warfare for protecting shipping and interdicting enemy sea power through air operations. All of these missions are fully within SAC's capability to perform if we have adequate force structure.

Given the proper tactical situation, our aerial minelaying can be a most effective deterrent. However, our sea power interdiction capability is severely limited by the lack of weapons with enough range to allow aircraft survivability. Most importantly, today we would have to remove forces from their SIOP commitments in order to accomplish these missions.

Because of the collateral nature of the tasks, I do not believe they should be included when calculating the U.S.-Soviet naval balance of power. By counting forces that may or may not be available depending on the scenario, we would be creating a false picture of our own strength vis-a-vis the Soviets.

SAC SPF

Senator NUNN. What are the advantages of the SAC strategic projection force and what resources are needed to achieve the needed capability?

General ELLIS. Senator Nunn, SAC's Strategic Projection Force provides an inexpensive, near-term solution to a national problem. There are several factors which make the SPF a potent force of diplomatic consequence. First, the SPF provides our national decision makers with a quick reacting, long range composite force of heavy bombers (B-52H), tankers (KC-135) and reconnaissance assets which can [deleted] work in concert with theater commanders. Secondly, this is a flexible force where military response can match the threat—from show-of-force to weapon employment. Another most important factor is its rapid response capability, the force can deploy within [deleted] and be flying operational missions within [deleted] after landing at a forward operating location. Finally, the long range of the B52H allows the force to bed down [deleted] and strike deep into enemy territory. I know of no other combat-ready and tested force within the Rapid Deployment Joint Task Force that can react this fast with such firepower.

To realize the SPF's full capability, however, there are weak links which must be strengthened. For example, the U.S. must develop [deleted]. Additionally, funds must be made available for prepositioning war reserve materials (WRM), petroleum oil, and lubricants (POL), and munitions that are required to support immediate employment needs. Two other areas requiring attention are improved [deleted]. Each of these requirements have been identified, in detail, to the OSD, JCS, and Air Staff—with nominal funding all can be realized in the short term.

MX

Senator NUNN. What effect on the dynamic counter-military potential or military damage expectancy calculations would shifting the MX missile from the MPS deployment to silo-basing have?

General ELLIS. Senator Nunn, if the MX is based in silos as opposed to multiple protective shelters, [deleted]. The fundamental problem of survivability would not be redressed. Further, the Soviets would enjoy a five to one exchange ratio advantage where ten U.S. warheads would be at risk from two Soviet warheads. The 23 to 1 aimpoint ratio of the shelter basing shifts that exchange ratio to a 2.3 to 1 U.S. advantage.

PD 59

Senator NUNN. What are the constraining factors, if any, in having the capability to meet the requirements of the countervailing strategy as outlined in PD 59?

General ELLIS. The countervailing strategy implies the need for nuclear options at lower levels of conflict. It also implies a credible nuclear capability after absorbing an enemy attack. [Deleted.]

Senator WARNER. Thank you, General. Thank you, Admiral.

[Whereupon, at 11:30 a.m. the hearing of the subcommittee was terminated, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

FRIDAY, FEBRUARY 20, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

THEATER AND TACTICAL NUCLEAR FORCES AND CHEMICAL WARFARE MODERNIZATION

The subcommittee met in executive session pursuant to notice, at 8:35 a.m., in room 224, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Present: Senators Warner, Stennis, and Nunn.

Staff present: Ronald F. Lehman, Frank J. Gaffney, Jr., Edward B. Kenney, F. George Riedel, James C. Smith, Francis J. Sullivan, professional staff members; Brenda K. Hudson, clerical assistant.

Also present: Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Arnold Punaro, assistant to Senator Nunn; Gregg Pallas, assistant to Senator Exon; and Willis Smith, assistant to Senator Jackson.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee will come to order. For security reasons, there being no objection, the subcommittee will go into executive session.

General Rogers, I will put my opening statement into the record so that you may proceed with your testimony.

[The prepared statement of Senator Warner follows:]

PREPARED STATEMENT OF SENATOR JOHN W. WARNER

Today, the Subcommittee will hear testimony from senior officials responsible for the theater nuclear and chemical warfare forces of the United States. We will begin with the testimony of General Bernard Rogers, Supreme Allied Commander, Europe, who is well known to members of this Committee.

General Rogers, as the senior military officer in the NATO alliance, has direct and primary responsibility for ensuring the maintenance of a credible Western deterrent to Soviet or Warsaw Pact aggression at any level: conventional, chemical or theater nuclear. We have asked him to appear before us today, to provide the Subcommittee with his views regarding the current state of that deterrent, the ongoing and anticipated changes in the Soviet/Pact nuclear and chemical

threat to the alliance, and the responses which would be required on the part of the United States and NATO if we are to counter augmented Soviet capabilities.

Following General Rogers' appearance, we will hear from Dr. James P. Wade, Jr., Assistant to the Secretary of Defense (Atomic Energy), who will address policy and management issues relating to TNF and CW. Dr. Wade has appeared before this Committee on a number of previous occasions and will be supported by representatives of the Armed Services: Lt. General Kelly Burke, USAF, Rear Admiral Powell Carter, U.S.N. and Brigadier General Fulwyler, USA, who can speak to specific programmatic questions as they arise.

The subject matter of today's hearing is at once distasteful and of surpassing importance. No one relishes the prospect of nuclear or chemical warfare being waged in Europe—or anywhere, for that matter. The loss of life, the destruction of property and the havoc which would be wrought by the outbreak of such warfare are most unpleasant to contemplate. On both sides of the Atlantic, demonstrations in opposition to war in general and to the means of deterring nuclear and chemical warfare in Europe, in particular, have reflected the abhorrent nature of these issues. Consequently, notwithstanding the proximity of threatening Soviet forces and the widespread recognition of the growing capability of those forces to wage theater nuclear and/or chemical war, political leaders in NATO countries have been loath to press for controversial—albeit needed—modernization programs.

In December, 1979, a major departure from this practice took place. Ministers of the NATO alliance solemnly agreed to implement a major upgrade of allied theater nuclear forces. For the first time in many years, in the face of considerable domestic opposition and a concerted Soviet propaganda campaign, political leaders of NATO nations agreed that the alliance had to modernize its theater nuclear forces if their credibility and deterrent value were to be maintained. While much more is required by their action, NATO's leaders took a major first step toward preventing—by deterrence—the war we all so earnestly wish to avoid.

A second step along these lines was taken—in no small part due to the initiative of this Committee—when the Congress approved the construction of a facility to modernize the U.S. chemical arsenal. Even though the Soviets have invested heavily in offensive and defensive chemical equipment for many years, the United States indulged in a ten-year unilateral moratorium on chemical weaponry.

As in the theater nuclear field, we have reached the point at which our ability to deter chemical attacks by the Soviet Union is in jeopardy. It is my hope that the Reagan Administration will provide leadership in this field and will promptly follow up on the 96th Congress' action to restore credibility to our chemical deterrent.

We look forward to hearing the comments of our witnesses on these and other TNF and CW issues facing our country and the NATO alliance today and in the years ahead.

General Rogers, you may proceed.

Senator WARNER. General Rogers.

STATEMENT OF GEN. BERNARD W. ROGERS, SUPREME ALLIED COMMANDER, EUROPE, COMMANDER IN CHIEF, U.S. EURO- PEAN COMMAND

General ROGERS. Thank you, Mr. Chairman.

I do not have a statement for the record, but assuming that this subcommittee was interested in more than just theater nuclear forces and chemical warfare, as the activities related to NATO, particularly Allied Command, Europe, I would like to cast some remarks about the military situation in Western Europe in the context of the Warsaw Pact and Allied Command, Europe.

I just want the record to reflect, Mr. Chairman, that I appear as the Commander in Chief European Command and not in my international hat as SACEUR.

After I have covered the military situation, I want to deal more specifically with U.S. Forces in my EUCOM hat.

STRATEGIC ENVIRONMENT FOR NATO

The current military situation is a new strategic environment for NATO as a result of events that have occurred external to the boundaries of NATO and because of the convergence of trends that are coming to focus in the first half of the 1980's within the boundaries of NATO. Underlying this current military situation is the relentless growth of Soviet military power over the last 15 years, certainly familiar to the members of this committee, and that growth has been directed at gaining and maintaining the quantitative and qualitative lead, and they are succeeding.

As a consequence, it is my opinion that NATO has now been surpassed, or very soon will be, in all categories of warfighting capability necessary to carry out our strategy.

The Soviets also face internal challenges in the 1980's, but there is no evidence to indicate that there will be a reallocation of resources or a realignment of priorities. Those familiar with history know that excess military power and internal problems oftentimes cause a rationale for external excursions.

The broader strategic environment contains the additional menace of Soviet willingness and capability to project her military power throughout the globe for political purposes, using proxies in third world countries, or her own forces in areas contiguous to her borders.

By virtue of the Afghan invasion, the Soviets are in a better position to threaten the region whose resources are indispensable to the West, and thus NATO faces a new global environment which contains a dual menace and requires a dual response.

NATO LONG-TERM DEFENSE PROGRAM

In the last half of the 1970's, after finally realizing that the foundation of detente comes from strength, the alliance made a major commitment to upgrade its deterrent posture. The benchmarks of that commitment—the long term defense program, the commitment to a 3 percent annual increase in defense budgets, the long range theater nuclear force modernization and the decision at the same time to walk down that parallel path of arms control to try to reduce and balance those theater nuclear forces, the rapid reinforcement plan, the very strong statements last December from NATO Ministers about the Polish situation which reflected the solidarity and cohesion and resolve of the alliance.

But what about the performance of the allies to meet these commitments within their boundaries? It is cause for great concern. There is the continual relative decline of NATO's capabilities versus those of the Warsaw Pact. We get stronger every year in Allied Command, Europe, but the gap between our capability and that of the Warsaw Pact grows wider. Too many security commitments made very solemnly by allies on both sides of the Atlantic are now turning into what I call overdue promissory notes. The coupling of this steady

accumulation of Soviet military power with the insufficient and faltering response by the alliance places in jeopardy the very credibility of our deterrent. The changed strategic environment with the increased threat to the collective interests outside NATO further strains that deterrent.

STRATEGY OF FLEXIBLE RESPONSE

Looking, then, at what we might do in order to rejuvenate our efforts and buttress the capabilities of our deterrent, first we should retain our strategy of flexible response, in my opinion. It requires the provision of an integrated military structure, demonstrated political will, and unity of purpose. It requires a triad of forces, that continuum from the conventional at the lower level through the theater nuclear up to the strategic. The deterrent value of that triad lies in its collective contribution to the uncertainty of our potential response because under the strategy of flexible response, we may escalate on our own volition, or we may engage in the initial conflagration at a level of violence not anticipated by the Soviet Union. So it is uncertainty of our response that is important in that strategy.

The U.S. strategic nuclear forces are the ultimate guarantor of NATO's deterrent. But those forces must be coupled to the security of Europe through this strategy of flexible response. We must have credible nuclear forces, and therefore the alliance must follow through on the 12 December 1979 decision to modernize its forces with the Pershing II and the GLCM. And with the Allies, we must be prepared to conduct a conventional defense. A conventional strategy will be perceived as viable by the other side only when we have sufficient force of the proper type that are adequately manned, properly equipped, appropriately trained, suitably deployed, capable of going to the defense in a timely and effective manner, and staying on the defense until we accomplish our mission.

And I say to you, Mr. Chairman, that we face major challenges in all of those areas in Allied Command, Europe today. Equally important, of course, is to have the perceived collective will within the alliance to resort to the use of force if necessary.

Now, what about meeting the challenges outside NATO's area in this new strategic environment?

ADDITIONAL FORCES AND RESOURCES NEEDED

First, I think the alliance must acknowledge that the United States and the Allies must provide additional forces and resources, not just redistribute resources that are already inadequate.

Second, we must recognize that only a few member nations have the capability to act to protect common interests outside the boundaries of the alliance. The rest of the nations must take up the slack within the alliance itself, the so-called division of labor. And to compensate for resources committed to the defense of collective interests outside NATO, all of us must improve and accelerate our readiness, our reserve capability, host nation support, airlift, ammunition stocks, prepositioned war reserve stocks.

If the alliance is to upgrade its capability and respond to the new strategic environment, it faces numerous resource challenges.

Most of the deficiencies, Mr. Chairman, have been identified by the alliance, and commitments have been made by Allies to correct them. The rhetoric in NATO fora is good, but what we have to do now is to put material substance on that rhetorical frame. Nations must carry through on their promises and increase their efforts if we wish to have a credible deterrent.

Of all the challenges which we face now in Allied Command, Europe, I think the most fundamental is convincing the peoples of our countries that these are critical times, and it is not business as usual.

DEFENSE BUDGET INCREASE

I am encouraged by what I see in this country. The language here is good. The ball has been passed to the Congress court. The Allies in Western Europe will be watching very carefully what the Congress does with respect to the increase in the defense budget. We have to set the example if in fact we are going to continue to be the leaders within the alliance. But our peoples must be convinced that security needs now have primacy in the priority list of the allocation of resources, and political leaders must understand that the limitations that they place on resources for security arrangements must correspond to the degree of risk to our freedom which they are prepared to assume.

And today that risk is high and it is growing.

Now, what about EUCOM: U.S. Forces, European Command? If the United States is to fulfill the commitment with which they charge me in my hat as CINCEUR to provide me in my other hat as SACEUR those forces necessary to accomplish our mission, we must improve U.S. forces across the board. In the face of the challenges in European Command, my priorities are readiness, reinforcement and sustainability.

In readiness, personnel must have the highest priority. Our deterrent depends on motivated and trained and experienced personnel. They need decent working conditions, and living and recreational environment. They need increased levels of family housing. They need military construction funding for living and working conditions.

And I would say, Mr. Chairman, that we are very pleased and very gratified that those who have been the recipients of the action of the Congress this past year, your package, the other package, the pay raise, all of those have been very helpful. The payoff will come later. We can't yet measure it although the indications are good.

NATO AND MILITARY CONSTRUCTION

But on the subject of military construction, Mr. Chairman, I want to divert for a moment to place into the record my great concern of the problem that I face. The attitude of the Congress in the past several years, whether they mean it or not, is reflected as being, "If it is in NATO, build it out of NATO funds." I manage the bulk of the NATO infrastructure funds. There are certain criteria which must be met. I cannot change those criteria. They must be changed by political authorities. So the recommendations that I make must be within the

criteria for all of those projects that we have—and we have thousands of them—that need to be built with NATO infrastructure funds.

If we cannot build certain items with NATO infrastructure funds, we then have to come to the Congress and ask for military construction funds for maintenance facilities, for living and working conditions, to receive new equipment that is coming in—and I can give you examples, if necessary.

But when the Congress says to me, build them out of NATO funds, they are not going to be built because I cannot unless they meet the criteria. And who bears the burden? Not I, although they look to me as the leader to do something about it; it is the soldiers and the sailors and the Marines and the airmen who are living and working and performing in conditions that you wouldn't permit, and unions would not permit their people to work or live in.

I need help on that, Mr. Chairman, and I need it very badly.

Senator WARNER. Shall we stop there a minute?

I remember vividly sitting here last year particularly with the question of hardening your command, the barracks, and so forth.

Did we have some line items last year that were rejected?

Why don't you come up here Mr. Smith?

Mr. SMITH. Yes, Mr. Chairman, I will have to go back and look at the record. There are specific line items that the committee did reject.

Senator WARNER. Excuse me; you know Jim Smith, General.

General ROGERS. Yes, sir, I raised this subject with him before we started today, Mr. Chairman.

NATO INFRASTRUCTURE FUNDS

Mr. SMITH. There were specific line items that the committee did reject, the major one being headquarters for the EUCOM, a hardened headquarters for the EUCOM and relocation from Stuttgart to Belgium. The position the committee has taken during the past 5 years, roughly 5 years, is that operational facilities that meet the definition of NATO infrastructure should be built with NATO infrastructure funds. Administrative facilities, maintenance facilities and that sort of thing are built with U.S. funds unilaterally with appropriated dollars, and that is the position that this committee has taken consistently now for about 4 or 5 years.

General ROGERS. All that I ask, Mr. Chairman, is that the committee understand what those criteria are. I can assure you that if they meet the criteria and the funds are available, they will be funded under infrastructure funding. But take the example of the extension of the underground facility for SHAPE. There is a somewhat of a sordid history associated with that, Mr. Chairman, and I might as well put this on the record since Jim has raised it.

The Congress 2 years ago said to us we will not provide the funding for that facility—it is not eligible under the infrastructure criteria—until you can assure us that the Government of Belgium will agree to having U.S. Forces in that underground facility in time of war.

I went to the Prime Minister of Belgium personally and met with him and got his agreement that we could build that extension.

Senator WARNER. Let me interrupt. We departed momentarily more or less from the subject of the day so we could get into military construction, which is a subject dear to the heart of General Rogers, and we are trying to trace the history of the positions taken by this committee, and how those positions are in conflict with the prescribed criteria for the authorization under which you act in spending NATO funds; is that correct?

General ROGERS. That is correct. And on the extension I went to the Prime Minister and asked him for authority, and he gave me that authority. We then came to the Congress asking in the 1981 budget for the facility, but it was deleted. That funding was deleted, and Congress said, "Let NATO build it."

Well, we had to have the authority to expend the funds before the end of last calendar year, so I had to go back to the Prime Minister and say, "Well, I'm sorry, Mr. Prime Minister, but my country would not fund that extension, so we will not have one there."

Now, what does that mean? Well, it means that some way I must find a means [deleted]. Now, we will find some way to do that. We also are looking now [deleted] which will cost some money.

But I just point out that example. If you are going to line out such items, please let us know so we can bring to your attention the impact it is going to have over there. It certainly did not help my credibility, I can guarantee you, Mr. Chairman, to go back to the Prime Minister and say, "Well, forget everything I asked." There are other examples we could use.

My plea is please understand the situation in which you have placed us. It is a Catch-22 situation. I recognize that there are constraints on funds in military construction that can be provided by this country. I recognize that there are constraints on funds that will be provided in the international role under the infrastructure funding, and those constraints will result in priorities as to what will be built.

But don't put us in the position of trying to force NATO criteria which are not there on the infrastructure funding.

Senator WARNER. General, let's spend a little more time on this. I am on the Military Construction Subcommittee.

Jim, would you like to put in the record your response to these statements so it is framed?

Mr. SMITH. I think General Rogers has stated it accurately. The problem is having enough Milcon dollars to go around for the competing requirements.

MILITARY CONSTRUCTION IN EUROPE

The number of dollars that have gone into construction in Europe in the past 5 years has gone up dramatically from about \$100 million in 1975, and last year it was over \$600 million, if you include our contribution to NATO infrastructure. So significant dollars, significant increases have been made in the dollars that are going into Europe. It is not enough, obviously, because the troops are living in terrible situations. Some of those maintenance facilities are just deplorable and should not exist.

This committee has consistently funded maintenance and living facilities. It is the operational facilities, such as the headquarters that

we have spoken of, such as POMCUS facilities, such as aircraft shelters, that we have insisted in the past that they go back and look at NATO infrastructure funding before the United States agreed to fund them unilaterally.

I think, Mr. Chairman, it might be appropriate to look at the language that we put in the committee report on our military construction in Europe last year because it traces some of this and might help to complete the record at this point.

Senator WARNER. General Rogers, is there one project that would help you specifically and symbolically if you were able to deliver it this year?

General ROGERS. Fund the maintenance facility for the 3d Squadron of the 12th Cavalry at Bidingen. There you have a cav squadron out in the mud, in the open, trying to maintain very expensive equipment, and it should not be.

Now, I want to make another another point, Mr. Chairman. There are four committees who impact upon this: This is one.

Senator WARNER. Actually, I don't think this is one. This is the Subcommittee on Strategic and Theater Nuclear Forces.

General ROGERS. Well, let me rephrase that. The Subcommittee on Military Construction in the Senate Armed Services is only one. There are three others that impact on it, obviously, the two appropriations subcommittees and the House appropriations subcommittee.

Senator STENNIS. Mr. Chairman, may I ask a question on that point?

General Rogers, the situation you testified about, did that come through some limitation that came from the authorizations side here, or did that come through the appropriations bill limitations?

General ROGERS. I say it is impacted by all four committees.

Senator STENNIS. I know it is impacted.

General ROGERS. The House Appropriations Subcommittee on Defense impacts very heavily in that area, Senator Stennis.

Senator WARNER. Senator Stennis and General Rogers, this is a symbolic project you think would do a great deal to restore the confidence of your peers and your ability to deal with your colleagues; is that correct?

Well, I will try to take it as a personal project to try to deal with my colleagues here in the Senate, and perhaps stray across the aisle and go into the House, just to educate myself on how one of these things passes through our legislative body, and see what we can do to get this one facility.

General ROGERS. Fine.

Senator WARNER. It is clearly identified?

Mr. SMITH. Yes, sir, I have enough information to do it.

Senator WARNER. You picked out the one, and we will see what we can do.

General ROGERS. All right, fine.

Senator WARNER. Then I will come over there and take a look at it personally.

General ROGERS. All right, sir.

Shall I continue?

Senator WARNER. Yes, go right ahead.

General ROGERS. I will just add a footnote to all that we have said there, that a decade ago we decided when we initiated the Volunteer Force that there would be a premise under which we would function, and that would be we would maintain adequate standards in Europe as well as every place else for volunteer soldiers, sailors, marines, and airmen, and we have not done that in Europe, Mr. Chairman. I underscore inadequate O. & M. funding because it degrades theater readiness. You gentlemen are familiar with that. We must improve our capability for chemical warfare. We have improved our defensive capability with our U.S. forces. We have major deficiencies in some other allied countries in defense against chemical warfare, but more needs to be done in the defensive side, and this country is doing that.

Senator WARNER. What have we done on the defensive side?

General ROGERS. Over the years there has been considerable funding. When I was the Chief, I recall there was 1 year with \$218 million in the budget for the purpose of providing protective overgarments, alarm systems, and some decontamination capability. We are making progress. In Europe today U.S. troops can fight in a chemical environment for x number of hours, and x comes out to about [deleted] under the conditions we have at the present time. So we have made major improvements.

NATO ALLIANCE RETALIATORY CAPABILITY

But what we are doing in the alliance. Mr. Chairman, is hiding our heads in the sand when it comes to a retaliatory capability. What we are leading up to is the only adequate response to a chemical attack by the other side is the use of theater nuclear weapons. What I want is for the alliance to have a chemical retaliatory capability in adequate numbers, that is modern, not obsolescent, as our current capability is, so as to deter the use of chemical weapons by the other side. There was no use of chemical weapons in World War II because both sides had them and were deterred. [Deleted.]

BINARY MUNITIONS

What would I like to see done? Well, that is no different from what I have said before, and that is for the United States to start producing the binary round. [Deleted.] The fact that the United States is producing a modern binary round, in my opinion, will have the salutary effect of sending the message to the Soviet Union: "We are going to retaliate if you use chemical, we have the capability and we have the will."

Under current conditions, we are placing ourselves, I believe, in a very dangerous position. [Deleted.]

[Deleted.] That is why I keep asking in my U.S. hat that the United States start producing the binary weapon so we can send the kind of message that we need. [Deleted.]

Senator WARNER. Well, let's pause a minute on this one because this is definitely within the jurisdiction of this subcommittee, and last year Senator Stennis and Senator Jackson led the fight on the floor—and I was there in the capacity of just sort of a backup individual, and I recollect the main deficiency that we had was intelligence that we could share with our colleagues.

That brings to mind the initial question, is there hard intelligence, and the next question, the extent to which we can go public with it if we have to go on the floor of the Senate? It is virtually public unless we went into executive session. Time and time again those in the Senate who had objection—and I don't point to them in any sense to denigrate their position, but they said we have no intelligence that the Soviets have this capability.

Now, where have we progressed since—when was that, Senator Stennis, last June or July?

Senator STENNIS. A little later in the year than June.

Senator WARNER. Have I correctly stated it?

Senator STENNIS. Yes; I think you have. We considered having the kind of a rap session back in the respective cloakrooms to try to get this over. We couldn't come out on the floor and say much, and that is what caused it to finally fall through.

CHEMICAL WARHEADS

General ROGERS. Well, Mr. Chairman, if the evidence that you want is [deleted].

What we do have is information as to the types of weapons, the types of chemical warheads that they have, the information on the training that they conduct, the information on their doctrine for the use of chemical weapons, information on the number of individuals that they have assigned for chemical purposes to units, their decontamination capability, all of those kinds of things. We know all of those things, and we know from their exercises that they speak of functioning within contaminated areas created by themselves, which means they have used offensive chemical weapons in their exercises. [Deleted].

Senator WARNER. Well, it is my intention to work with the Secretary of Defense myself, and others, to make the best case we can, and then provide an assessment of how much of that we can go public with, and take this on in a frontal attack. It is unquestionably one of the most distasteful issues that will be before this Congress, but I am perfectly prepared to rejoin the fight, and I am of the opinion the Senators Jackson, Stennis, Tower, and others will give us support.

So we will give it all we have this time. But I feel very strongly, I am a modest historian of military matters. My father was in World War I in the trenches and suffered the gas, and those memories are ever so vivid in my mind; therefore, I have the motivation to go forward.

Senator Stennis, do you want to comment on this chemical thing before we proceed?

Senator STENNIS. I think it has been rather well covered. It is a question of judgment, Mr. Chairman, on when to call the thing up, and that varies from day to day, and this is not a popular subject to vote on, I mean, a rollcall vote. Time ran out last year. That is the best way I can describe it.

Senator WARNER. Actually, my recollection is the Senate did rather well. We got in the funds two pieces, one piece for construction of buildings, one piece for equipment, and we got the buildings through; did we not?

Mr. SMITH. The funds for the facility, \$31½ million, were approved in both authorization and appropriations bills. They were being withheld by OMB the last I heard, and they were not being permitted to build the facility—the funds were being held.

The funds to equip the facility, \$19 million, were in the House bill, not in the Senate bill, and dropped out in conference at the last minute.

Senator STENNIS. That is the item I am talking about, the \$19 million.

Senator WARNER. Well, General, I hope we will part with some confidence that your colleagues in the Senate will go ahead with this.

General ROGERS. I have two other priorities. With respect to reinforcement, it is very important to us over there that the reinforcements from this country arrive on time and prepared to fight. We must improve our strategic lift in order to accomplish that. We must improve our ability to receive them, and we are working on that with our allies. The POMCUS stocks need to be brought up to full level, and in fact, the three division sets that are there now are only about [deleted] percent filled, that is, [deleted] percent would be categorized as [deleted]. We also need to work further with our allies on host nation support.

I mention also the great part that Reserve components from all countries in the alliance play as they mobilize. Fifty percent of our wartime authorized strength comes from mobilizable reserves. We need very badly, particularly, the combat service support units from this country that must come very quickly, and they are not at this time in a state of readiness that would permit that.

PRE-POSITIONED WAR RESERVE STOCKS

With respect to sustainability, it obviously means enough ammunition and pre-positioned war reserve stocks on hand until the industrial base can take over and produce that steady stream which we must have.

With respect to ammunition stockage, we are better off in the U.S. Forces than our allies, but we do have some dangerous shortages in certain types of ammunition. I would have to describe the pre-positioned war reserve stocks of the United States as being [deleted].

With respect to the industrial base, it comes as no surprise to this subcommittee that our industrial base today cannot now support us in time. If we were working on the old D to P procedure, that is, having sufficient stocks on hand at D-day until production could pick up and give us a steady stream, we should have, for example, [deleted] ammunition pre-positioned in Europe.

Well, the NATO stockage level to which all nations aspire is [deleted]. Our allies would come out at about [deleted]. The guidance that we have on the U.S. side is [deleted], but I am just saying to you, Mr. Chairman, something has to be done about this industrial base, again, if we are serious that we are going to defend ourselves and be perceived as being able to do so.

ADEQUATE MANPOWER BASE

Sustainability also requires an adequate manpower base from which to mobilize. You have heard me talk on this subject when I was Chief

of Staff and at other times. We do not have that manpower base in the U.S. Army today. Even with registration in effect, and even cannibalizing the late-deploying Reserve component units and putting their troops in the Individual Ready Reserve—the pool of trained manpower—this country will run out of infantrymen, tankers, artillerymen, and combat medics before the draft can take over and send me a steady stream for replacements for combat casualties.

We have known of this deficiency for years, and every time we have a mobilization exercise such as Nifty Nugget and Proud Spirit, it comes out again. This country has been putting Band-Aids on that problem, and the latest one was a fairly sizable compress, when we decided to give an individual \$600 to reenlist in the Individual Ready Reserve and pay him over a period of 3 years. That will help somewhat.

IMPLEMENTATION OF THE DRAFT

My concern is this, Mr. Chairman. When I was Chief of Staff and bore the responsibility to provide those replacements, I was very unhappy with the situation. I am now the receiving commander, and I can tell you my displeasure is equally as high. I frankly am embarrassed that this country, as it beats our allies around the head and shoulders to do more, finds itself in the position that it is going to run out of trained manpower in combat skills before the draft can take over, even if the Congress implements the draft on the first day of mobilization.

The Congress is charged by the Constitution to raise and support armies. Generals aren't supposed to go around and offer solutions, but I can tell you, Mr. Chairman, this country has to face up to that deficiency and do something about it, again, if it is serious about being the leader in our alliance. And I ought just to underscore that by telling you that our allies know of our situation, and there have been heads of government who have told me that they will not believe our country is serious in its defense efforts until it again brings back conscription. Among those who have told me that are some of the most powerful allies that we have.

CONSCRIPTION

Senator WARNER. Well, now, General, on that point, let's put in the record those allies that have conscription within their countries.

General ROGERS. Fine.

Senator WARNER. And they are, of course, the Republic of Germany—

General ROGERS. All of them except the United States, Canada, the United Kingdom, and Luxembourg. The rest of them have conscription, and it runs anywhere from 8 to 20 months under current conditions.

Senator WARNER. Just roughly how do they do it? Take the Federal Republic of Germany. Of the number of young men and women coming of age, what percentage do they take, and what are the basic criteria that they follow?

General ROGERS. I can give you some feel for that. They have coming through the window every year I believe it is about—and I will correct this for the record—400,000, of whom they take—

Senator WARNER. Is that men and women?

General ROGERS. Men, of whom they take 220,000, and they serve for 15 months. But they are going to run into demographic problems, too, just as this country is, about the middle of this decade when they are only going to have about 185,000 come through that window, which means they are probably going to have to extend their conscription period from 15 to 18 months in order to take up that slack.

But today they have more coming through the window than they need, so they choose from the top those that they want to be drafted, those that they think are the best qualified.

Senator WARNER. When you say the top, it is a composite of physical and mental qualifications? They literally take them out of the top.

General ROGERS. Yes, sir, and they are good.

Senator WARNER. And the attitude of these young people; is it one of pride to serve?

General ROGERS. I think you will find that the current generation in Germany has the same difficulties as the current generation in this country. They have never experienced a war and they really don't know what it is all about. They have some difficulties with their youth over there. When they try to have public swearing-in ceremonies, there have been within the last year some fairly violent demonstrations against them by the youth. Again, in some instances, at least, it is the same as in this country; that is, a group of activists looking for something to be active about. The same as when registration was being considered in this country. You had groups of activists looking for a cause who latched onto registration and camped on the doorsteps of the Capitol in protest.

My concern is we don't let that small group of our population decide for us what is necessary in order to preserve our freedom. You see, behind all of this, Mr. Chairman, is the fact that I am convinced of the criticality of these times, and particularly the first half of this decade. Even if we had all the money piled here that we need, and all the allies need, we wouldn't get the payoff until after the middle of this decade. But at least it would show that we are serious. And that is what we have to do, to show our resolve that we will do what is necessary to defend our freedom.

There are two other areas.

Senator WARNER. I personally share that, I want you to know. And I am sure that my chairman also shares it. I think our President now is making enormous strides in this direction. The question remains the extent to which the Congress is going to back him up.

General ROGERS. Exactly.

Senator WARNER. I have great confidence in this committee.

General ROGERS. I would add, Mr. Chairman, from my perspective, sitting in Europe, it is very encouraging to see what this country is doing. All will watch very carefully the actions of the Congress with respect to the defense budget. They want the United States to lead in the alliance. They don't want it to be too loud, but they want that leadership to be there. They want the example set by this country. If we don't set the example now with the climate that we have in this country, there is no way that those of us who speak out in allied countries along the line I do today, will convince them to do more unless we do so ourselves.

CONSULTATION WITHIN THE ALLIANCE

But when I speak of leadership within the alliance, it has to be leadership that is in a consultative mode. Consultation to the alliance is very important, but consultation to our allies does not mean being informed after the fact, nor being informed at the time a decision is made; it means consulting with them before we make a decision and letting them participate in it. The best example of how we did it properly within the alliance was with respect to the modernization of the long-range theater nuclear forces. U.S. teams went to the countries, went to NATO and presented the arguments very cogently and logically and got all the alliance behind the decision. So that on the 12th of December, 1979, painful as it was to some countries, consensus was reached in the ministerial meeting, and consensus in the alliance is defined as unanimity.

Two other areas I just want to mention, Mr. Chairman, in which I believe this country and the alliance must make major efforts. The first one has to do with exploiting the collective technological and scientific superiority of the West, in order to find breakthroughs which will be helpful on the battlefield. When we discover the results of our technology, don't export it to the East because we are going to find the Warsaw Pact using it against us very quickly because the Soviet industrial base can produce in great quantity and with high quality.

The second thing, very important in my mind, is that we must, with as much vigor as we can muster in this country, pursue with the Soviet Union adequately verifiable arms control measures. Such measures give us some stability, some manageability, and some predictability in the military situation. Although I mentioned that subject last, it is very high on my priority list.

Senator WARNER. Well, General, on that, again I share your viewpoints. I must say that the argument of linkage is a very forceful one, and the problems confronting the Soviet Union now with respect to Afghanistan and Poland, instability in the Warsaw Pact countries, where is that little window of opportunity where we as a Nation, in good conscience, can initiate these talks?

General ROGERS. I understand that, Mr. Chairman.

LINKAGE

Senator WARNER. Perhaps you would share with me and the committee your views on the subject of linkage. It seems to me you are addressing us as a military commander, and you would like to have established parameters in the strategic area of what you know to exist and what you have to confront so that you can do your planning. On the other hand, the President and the diplomatic side, and indeed, the country as a whole, perceive the Soviets as constantly participating in adventurism and things that are totally alien to our philosophy, and to say to the President, his negotiators and the Congress, that is, the Senate, that eventually has to ratify it, how can we in good conscience initiate these talks when there is no basic trust in the Soviets, there is no manifestation of their intentions to live up to such an agreement? Where is this window that we can get started?

General ROGERS. Let me speak from the perspective of our Western European allies. As far as they are concerned the December 12, 1979 decision to modernize our long-range theater nuclear forces with the Pershing II and the GLCM included a parallel decision, which was of equal importance, that we would engage in arms control negotiations to try to reduce and balance those theater nuclear forces. [Deleted.]

So it is important that this country be perceived as being prepared soon to engage in those kinds of discussions.

Now, when you talk about that—excuse me.

Senator WARNER. Does that mean absent any thought of linkage then?

General ROGERS. You see, in my opinion, the linkage doesn't mean much to our European allies. I don't think that most of them believe in the indivisibility of détente. We do, and we rightly should. There is that linkage. But when one looks at some basic facts, the objective of the Soviet Union is never going to change with the current government that it has; namely, that someday it will dominate the world. That objective will never change. So let's don't make linkage so difficult that we think we are going to change that objective.

Let's also recognize the fact that détente means different things to the Soviet Union than it does to us. We discovered that, as I mentioned in my comments, in the 1970's, and finally near the end of the 1970's, we turned our attention in the alliance to doing more.

So it depends upon how strong you make that linkage. But I just say to you, Mr. Chairman, under today's conditions [deleted].

Now, the Belgians postponed their decision concerning GLCM deployment. They were to have made it in June of 1980, but they postpone it about every 6 months. I have gone to see the Prime Minister on this subject. I have written to him also. I have seen the Minister of Defense. I have also written to him about the importance of Belgium's making an affirmative decision; but she is equivocating. It is another one of those coalition governments of four parties. [Deleted.]

[Deleted.]

LONG-RANGE THEATER NUCLEAR FORCES MODERNIZATION

The modernization of LRTNF is my No. 1 priority, to follow through and get those GLCM's and Pershing II's deployed. That is why I say it is important that at least some noises be heard from this country that we are working toward negotiating with the Soviet Union again on arms control for theater nuclear forces.

And of course, under current conditions, I don't believe it can be associated with SALT II.

Senator WARNER. I was going to say, would you see it being structured in such a way that it should be split off from SALT II and totally separate?

General ROGERS. I think we have to under the conditions that obtain. I still believe SALT II should have been ratified. I did not testify on the subject, but militarily it came out a wash for me, the advantages versus the disadvantages. So I recommended ratification for other reasons, and those reasons are still pertinent today. One, the

credibility of the Office of the President; two, our credibility with our allies; and three, the impact on our relationship with the U.S.S.R. should we fail to ratify, and how that might impact upon the Allies. And when I got over to Europe as SACREUR I found that those reasons were just as pertinent as they ever were, and still are.

The United States has to do the negotiating about theater nuclear forces. The Allies want the United States to negotiate, but they also want it done in that consultative mode. "Don't come to us and tell us what you negotiated after the fact," they will say. "Come to us and discuss the positions that you are going to take in your negotiations before you go."

In my opinion we didn't do that in SALT II. It was after-the-fact consultations primarily that we had. We have the organization and the mechanism going now with the special consultative group which gives us a capability to consult beforehand with our allies.

Senator WARNER. Gentlemen, I think at this point we will turn to my colleagues on the committee.

The Chair has an indefinite amount of time it can devote to this hearing. Therefore I will defer to my colleagues for any questions or statements that you may wish to make, and then I will begin my series of questions.

Senator STENNIS Mr. Chairman, I thank you. I will take very little time. I am pleased to be here to hear General Rogers.

I want to make one more reference to his subject about the gas. There was a real effort made to get the \$19 million. The session dragged on some. The year was about to run out, I mean the legislative year, and those of us on the conference learned, you know, the parliamentary situation that would develop if the bill came back with that item in it. That was really the final decision that was made on that basis, the parliamentary situation. But it is just a judgment question here, we are trying to get the money.

So I hope you—I know you will keep on.

MANPOWER—CONSCRIPTION

I just want to make this point, now, about the manpower. I concluded that we are not going to get the conscription that you referred to, the power to induct until the President of the United States, whomever he may be, takes a positive leadership position in that, and I don't know whether Mr. Reagan has really had that matter explained to him or not. He has had so very much to do. He has a very attentive ear, but I think it ought to be brought to his attention again from a man of your experience and capacity. I just say that without interfering with you in any way. Something has got to be done in that field, but you just can't do it outside. People won't be convinced of the need until the President, whomever he is, says so, and that will really release all of the military to say so.

That is rather blunt, maybe, but that is just what we are down to, I think, and without that power, I am concerned about our military future, and I am concerned more on that than any other thing.

Thank you very much.

Senator WARNER. Thank you very much for joining us.

Senator Nunn?

THEATER NUCLEAR FORCES NEGOTIATIONS

Senator NUNN. Mr. Chairman, I don't want to retrace what General Rogers said. I will get caught up by people who have been here. But the latter point, when you explained the various complications about theater nuclear forces, and what one country did and what another might do, I do agree with that analysis. I just got back from London. I think you were there right before I arrived and I missed you, but at that conference and one in Belgium, and everywhere I have been, I agree with that analysis completely.

And I also understand your saying it needs to be separated from SALT II, because SALT II is in such a limbo and that we do need to begin negotiating, even if we don't get anywhere in negotiating, because if we don't negotiate theater nuclear forces in some form—if we don't negotiate some form—it is going down the drain, and in my view, that is why we have got a greater deficiency than in the strategic forces.

So the dilemma is in the freezing of SALT negotiations, we are endangering theater nuclear force modernization. But a further dilemma—and this is where I just want to get your thinking, I don't know whether we agree or disagree. My thinking is being formed in this area—I am really afraid of separating theater nuclear forces from strategic in negotiations because in the short run it may buy us forward progress on theater force modernization, but I cannot imagine the allies, unless there is a fundamental change in their thinking, in Europe, if we get down to the point of deployment and we have been negotiating theater nuclear forces separate from SALT, and we get to the point they have got to make a decision on deployment and the Soviets say we are going to break off all negotiations if you deploy, there won't be any other hope for theater force negotiations to succeed, I just believe we will be in a worse position. We will have bought ourselves 2 or 3 years, and it may be that that purchase, that we have to pay the price for.

But I think down the road they will have tremendous leverage in blocking the final deployment of GLCM's and the other theater forces just on a political basis, because what in effect we will have evolved ourselves into for many different complicated reasons is a reluctance to go forward with renegotiating SALT, where we are least are in a vague area of somewhat near equality, when we have some disadvantages, and we are getting ourselves into a negotiation on theater forces which everybody recognizes we have the least amount of leverage on, and we have the greatest disadvantage, and if we get blocked there from deployment, then the United States will have succeeded in taking arms control over the last two administrations and making not only a horrible mess out of it, but having it in effect block our own security requirements. That is my fear.

I would like your comments.

SALT TREATIES NEGOTIATIONS

General ROGERS. I did not mean to imply that we don't need to get on also with negotiations of SALT treaties. The question of whether or not both sides will agree to not violate what was included in SALT

II during this time, I think is highly questionable. I think we will not violate it, but the question is will the Soviets, and are we sure we know that they are not.

My point is, Senator, that the allies need to have some kind of reassurance from this country that we are serious about negotiating arms control for theater nuclear weapons. The allies also are very hopeful that some action will be taken in the SALT areas as well.

I personally found when I got there—different from what I had been told—that there was general consensus within Europe that SALT II should be ratified. The scenario that you have built, that if we go only with theater nuclear negotiations and forget the strategic negotiations could very well have the result that you predict.

But I am asking that this country give some indication to our allies that we are serious about negotiating quite soon on theater nuclear weapons. Otherwise we are not even going to get what we need most, and that is the modernization of our long-range theater nuclear forces. [Deleted.] We have to deploy them for deterrence, irrespective, unless the Soviet Union decides to destroy all of its weapons that reach into Western Europe. And you know, one must be a dreamer to expect that.

If you were to say to me, given your choice, which would you rather have us do, I would personally see us start negotiating within a consultative mode about the theater nuclear forces quite soon, and associate the linkage more with the SALT agreements rather than with the theater nuclear force negotiations.

Senator NUNN. The linkage on other matters.

General ROGERS. The linkage on other matters, yes, the indivisibility of détente, relate that more to the strategic level than to the theater nuclear level just because I am concerned about losing that long-range theater nuclear force modernization.

Senator NUNN. I share your apprehension on that. Thank you.

That's all I have.

LINKAGE

Senator WARNER. General Rogers, would you repeat that? Did I understand you to say that while you would emphasize linkage with respect to the strategic SALT area, you would put less emphasis on it with respect to proceeding separately with the theater?

General ROGERS. Yes. Linkage is important, but under current conditions, since my objective is to get on with this theater nuclear modernization business and not let anything happen to undermine that decision and its implementation, if we are going to make the linkage, make the linkage at the strategic level rather than have so great an emphasis on linkage at the theater nuclear negotiating level so that our allies can have some reassurance that we are going to get on with the latter. And having that, then we will have a stronger case for the modernization of our long-range theater nuclear weapons.

Senator WARNER. Senator Nunn, I didn't mean to cut you off.

Senator NUNN. No; I have had enough.

Senator WARNER. Let me go back over this ground, even though we may be repetitious, because I am fascinated.

It seems to me that thus far the statements by the Reagan administration established two conditions precedent to entering into negotiations in the strategic area, be they the TNF area or the overall SALT.

First is the buildup. To use the common phrase, we have got to have our chips in before we go to the table.

THEATER NUCLEAR FORCE BUILDUP

Now, let's deal with that a little bit in both areas. First, buildup in TNF. Do you think we are sufficiently built up in that area to go to the table?

General ROGERS. Not at all.

Senator WARNER. Not at all.

General ROGERS. But you know, you have to have a resolve at least to go to the table. With respect to having blue chips at the table, we don't have them, but we do have the blue chip of having made the decision we are going to modernize, and we must continue to get on with it. Every month that goes by, you get [deleted] more SS-20 missiles produced and you get [deleted] more SS-20 launchers deployed. They are up over [deleted] now, and when you multiply that number by three warheads on each launcher, and then [deleted] missile we believe each launcher has, you are getting into sizable numbers.

So the chips are building more and more on their side, both with the SS-20 and with the Backfire. The only chip we have is that we are going to deploy them [deleted].

[Deleted.]

So it is up to those of us who have the opportunity to deal with our allies to continue to emphasize these points, and to convince the Belgians to make the right decision, and, hopefully, to convince the Dutch. [Deleted.]

But all our European Allies are watching to see if the United States is serious about that second parallel decision that was taken in December 1979, namely, to start the negotiations of arms controls for theater nuclear weapons.

What I said about less emphasis on the matter of linkage for theater nuclear forces than for the strategic, comes from the perception of a SACEUR presently occupying the position. My predecessor's perception, in his present position as Secretary of State, may be entirely different. Of course, I am wandering in the political field now when I talk as I do.

Senator WARNER. Well, yes, you are, but nevertheless, you are certainly qualified to be, as we say in the law business, qualified to be an expert witness.

Now, this subject of linkage troubles me a great deal. I have a basic philosophy, you shouldn't deal with someone unless they in good faith represent their willingness to do so. But as I study the history of the Soviet nation, this proclivity toward warfare and adventurism and expansionism goes back for centuries, and to think that we are going to turn that around on any one set of negotiations or in any one short period of time is misleading.

General ROGERS. We are never going to change, in my opinion, the basic objective of that country.

Senator WARNER. That's right, and therefore I personally have come off this linkage thing a little bit now, and I am beginning to look at it as a realist.

What is your thought on it, Senator Nunn?

Senator NUNN. Well, I think it has got to be very, very carefully done, and I think there can be linkage if you are very skillful at it and if you don't try to link everything. I am somewhere between linking everything and linking nothing. I don't think we ought to go to linking nothing, but I think that we can't lay down ironclad rules. We are going to have to have some skillful people in positions making those decisions about how far we can push.

Senator WARNER. You know, I think back to when you and I were working together last spring on our various positions on SALT. It seems to me there was a point in time last spring where there was a 50-50 chance that SALT would have gone through the Senate.

Senator NUNN. Right.

SALT NEGOTIATIONS

Senator WARNER. The timing there was critical, along in May, June, and it was the consumption of time by the various committees toward getting their reports, and the delay of bringing this issue to the floor, but suppose we had ratified that treaty in May or June and then sat back and witnessed the incursion into Afghanistan, and now the destabilizing influences of Poland and the other Warsaw Pact,

I wonder what we would feel as a nation being bound by the SALT agreement and protocol, witnessing the Soviet Union breaking all sorts of—

Senator NUNN. Well, I was somewhere near where General Rogers said he was. I know there were some precedents in SALT II that bothered me very much, but as far as the pure military effect, I didn't feel like it would have a heck of a lot one way or the other, and I felt the whole, overall global political situation that SALT should be considered in that context, and also in the context at that time, as you well know, of the United States looking on SALT as an excuse not to do what we needed to do in our defense. So it was the broader picture that I kept trying to emphasize and still believe that we need to look at the broader picture. And I mean, I am certainly in favor of some linkage. But I think if we think we are going to get SALT, use SALT II when we are at a strategic disadvantage already, slightly, a huge disadvantage with theater weapons, if you think we are going to be able to use both of those negotiations as leverage to get them out of every place in the world, I think it is just, you are trying to capture aces with queens, and you can't do it. So it is going to take a lot of skill.

We have not been very—

Senator WARNER. But do we write a provision in the treaty to protect ourselves with linkage, to the effect that, all right, the treaty goes into effect on such and such a date, but if you have adventurism into another country, that would terminate it?

What do you do?

Senator NUNN. I think you can't write that. I think it has got to be done diplomatically. I think General Rogers already answered that.

My view is, you ought to do it diplomatically.

MILITARY STABILITY AND PREDICTABILITY

General ROGERS. That is correct, Mr. Chairman. You have to take SALT for what it is. It is a limitation on strategic arms. It is important because until we get it, you really don't have the stability we can have with it. As I said earlier, you don't have the manageability and you don't have the predictability, and the latter is very important in our business. To me, one of the advantages coming from SALT II was there was a fractionation clause in it. It said that "thou shalt not have more than 10 warheads on ICBM's or 14 on the SLBM's." That helps the military situation in both stability and predictability. Those kinds of things are important. But to try to caveat an agreement such as that with phrases and clauses that relate to actions in areas other than strategic arms would seem impossible.

Senator WARNER. It renders it a useless agreement.

Well, the sooner we advise the American public and I said—I don't want to be rhetorical here—in a speech the other night before the Reserves, one of our responsibilities is to educate the American public about the history of the Soviet Union, and in all likelihood, the course they are going to take in the years to come, and then from that base point, to then decide what we are going to do vis-a-vis arms limitations.

General ROGERS. Before Senator Nunn leaves, I would just like to make one comment.

Senator, you commented about the SALT discussions within the Congress, of trying to draw attention to the needs to rearm or to enhance our security arrangements. That was very helpful. As one who sat from the outside at that time—my being in Europe—he could sense that the turn this country made with respect to the need to strengthen our defensive arrangements came as a result of the appearances of the witnesses before the committees concerning SALT II; I think that was extremely valuable to the future of this country that that came about. I personally believe that is when the turn in this country came.

Senator NUNN. I agree with you on that. I think that was the foundation for it, and at that time we didn't know the American public was going to have to witness Iran and Afghanistan. At that time, when we think back on it, we were in somewhat of a euphoric mood about our defense.

I am delighted to see you.

Senator WARNER. General Rogers, would you advise the Chair on your availability to continue here for a while? What is your schedule?

General ROGERS. I have a luncheon engagement at 12 noon, and that is all, so I am available until then.

Senator WARNER. I presume our other witnesses are flexible in time because I would like to continue on.

General ROGERS. Yes, sir.

Senator WARNER. Do you feel there continues to be an operational requirement—this may be redundant, but I think perhaps our hearing this morning, because of our friendship and the tremendous interests of the Western structure, I would like to have it for the purposes of making a record, if you can indulge; if I go back over certain questions, you can be rather cryptic in your answers.

General ROGERS. Absolutely, and I regret that I have contributed to that, and I really didn't finish my comments.

Senator WARNER. Would you like to finish those?

General ROGERS. I would just like to get one point on the record, if I might, Mr. Chairman. Let me make two points.

DIMINISHING DETERRENT

One point I would like to make is that we chart our way ahead, the peoples of all of the nations of the alliance must be made to understand that the menace has grown greater in this past year, and it continues to grow; that it is a dual menace, internal and external to NATO's boundaries, and therefore we have to respond in a dual manner; that our relative ability to counter that menace has lessened; and that, therefore, the credibility of our deterrent is diminishing. When we talk of chemical weapons, when we talk of strategic nuclear weapons, theater nuclear weapons, we are talking about deterring their use, not using them ourselves. But, the credibility of that deterrent is diminishing.

I would also like to point out, though, as all of us know, the West has the necessary and superior resources in all areas: economic, social, political, moral, material, with which to achieve our security arrangements as needed. But again, the peoples of the countries on both sides of the Atlantic have to be prepared to make sacrifices, and I sense that the voice of the people in this country is being heard by the political representatives as saying we are prepared to make sacrifices, if you relate that to the voice saying we have to have greater defensive arrangements. But we will know, as the package that the President outlined the night before last goes through the Congress, whether or not the people of this country are prepared to make those sacrifices.

If they are prepared, they will set a great example for some countries in Europe [deleted].

The political leaders must exercise their collective determination to fulfill the security needs once the supportive voice of the people is heard. That is where those of us who have the privilege and are charged with the responsibility to be prepared, on very short notice, to take what is given to us by the nations and meld it very hurriedly into a defensive organization that can, in fact, defend our freedom of action, that is where it is so important to us that everybody gets the message across to our peoples, and that is why I would ask the help of this committee in that area.

Now I am prepared for further questions.

ENHANCED RADIATION CAPABILITY

Senator WARNER. Do you feel there continues to be an operational requirement for enhanced radiation capability to counter Soviet armor in Europe? Do you support the resurrection of the [deleted] program for this purpose?

General ROGERS. I do believe we should produce the enhanced radiation, reduced blast warhead. My position has not changed over the years on that subject. I would like to have it as a military commander for the reason that it can be used in closer proximity of our own forces than the current capability we have. With our current stockpile we can

achieve the same neutron effects, but the thermal and blast damage is so much greater, some would say up to 10 times greater, that when you consider using a [deleted] or an 8-inch howitzer round with the relative short range you have, you are only going to use them when your forces are in very close contact. It is much more helpful to a commander to be able to use a weapon in closer contact to his own forces, and that is why I want it.

Now, I hasten to add, Mr. Chairman, that the scar tissue is so broad and so deep in Europe because of the decision that was made by this country previously not to produce, that this is an extremely sensitive subject. I would not want this subject to be put on the platter of the allies at this time because it may well impact upon getting that final implementation of the long-range theater nuclear modernization, and that latter has to have priority, in my mind, over the production and deployment of the enhanced radiation, reduced blast weapon.

Senator WARNER. Now, does that admonition suggest that we should not even go into the R. & D. and production of this, or can we do that without any discussion of deployment? Can we separate the two?

General ROGERS. [Deleted.]

Senator WARNER. Dr. Wade, would you start from the beginning and reply to the General's statement?

Mr. WADE. Recent legislation last year before the Congress, Mr. Chairman, was in addition to producing the modules in a separate format from the warheads themselves, that we should also produce the [deleted] and then the decision thereafter about when to load the warhead can be made, but we are moving right now to be in compliance with that law.

General ROGERS. That is the second best option, and probably as good as we can have right now because the best option would be [deleted].

155MM WARHEAD

You asked about the 155mm warhead. I would like to have a new 155 warhead to replace the one which I think is almost obsolete. Maybe that is a little strong, say obsolescent. I was very pleased to learn that the decision was being made to build [deleted] the new warhead we need on that 155. We need it for several reasons: one, to give us a modern warhead, and two, because the Allies that have built 155 weapons, such as the FH-70 produced by the Germans, the Italians and the British, [deleted].

[Deleted.]

I understand that the executive branch of the Government in the last administration deleted that modernization item. I personally think that was a mistake. But I gather that those in the Office of Management and Budget who made that decision may still be present.

Mr. WADE. Oh, but not effective.

General ROGERS. But not effective I would hope.

We need the 155 modern nuclear warhead.

Now, your question is should it have the capability [deleted].

But there is a question, and there may be a serious one, and I am in an area in which my knowledge is of such a nature that I am dangerous. [Deleted.]

Senator WARNER. We will have to go to that issue later.

In your professional opinion, what are the risks of pushing for ER at this time?

Do you think it would jeopardize the TNF modernization?

General ROGERS. Yes, sir, I do think it would jeopardize it at this time. In that connection, I think what Mrs. Thatcher said the other day was fairly appropriate for all of Western Europe and that is we have said enough about it for the present time. Let's just quiet down. I think that is correct.

That doesn't mean that the United States can't go ahead and make the decision to produce as it is, and it has committed itself to consultation before deployment. [Deleted.]

THEATER NUCLEAR WEAPONS RELEASE AUTHORITY

Senator WARNER. How many individuals in Europe are empowered to exercise theater nuclear release authority?

General ROGERS. None. Well, I shouldn't say that. Mrs. Thatcher is, and President Giscard-d'Estaing is, in Europe, and President Reagan, but no one else is authorized to release nuclear weapons.

May I describe that, because that is a very important point, and oftentimes misunderstood, Mr. Chairman. [Deleted.]

I say that because I want it understood that political authorities within the alliance maintain very strong and tight control over the use of nuclear weapons, and they should. And I accept that. But it is oftentimes misunderstood. Some think that once initially released, there is freedom of action on the part of the military commanders on their subsequent use, and that is not so at all.

Senator WARNER. Perhaps you should tie in there the authority of the various C's with respect to the necessity for implementing release.

General ROGERS. I would prefer not to discuss, if I may beg that question, the subject [deleted].

Senator WARNER. All right.

If it were possible for the Soviets to eliminate or neutralize those authorized individuals, how could nuclear forces be brought to bear in battle? If the sensitivity is such that you prefer not to just indicate that.

General ROGERS. Well, someone else should respond to that. It is very highly sensitive, and I would not wish to discuss those arrangements.

Senator WARNER. We will pass that.

Do you see a need in Europe for upgrading TNF logistics support, including more designated transport vehicles and personnel to facilitate more rapid dispersal of nuclear weapons from centralized stockpiles?

General ROGERS. There is a need for those kinds of personnel, [deleted].

Senator WARNER. How would you characterize our capabilities to reconstitute our theater nuclear forces, following a preemptive attack?

General ROGERS. Well, one of the advantages that we would have would be the mobility that is built into some of our weapons. [Deleted.]

We have some capability with our Pershings and with our GLCMs to be able to respond, and also with the aircraft that are assigned for theater purposes.

Senator WARNER. This past week I had the opportunity to visit SAC, and in particular, the Minuteman sites, and I have a good strong understanding, now, of the procedures used for the release of those systems. But not having had the opportunity to visit your theater in many years, I am unfamiliar with the basic procedure for release or use of a nuclear weapon, say, wherever they are, regimental level, wherever.

Could you just take me through a typical scenario with a unit that possesses them?

General ROGERS. [Deleted.]

Senator WARNER. They are where—at division level and then deployed?

General ROGERS. [Deleted.]

Senator WARNER. In a [deleted].

General ROGERS. [Deleted.]

NUCLEAR WEAPONS SAFEGUARDS

Senator WARNER. General, let's talk a little bit about personal experience. My experience in combat is very modest, but I have seen situations where, in your forward deployed units, the communications have failed, the incoming is blowing everybody out of the saddle.

What is to prevent a couple of sergeants from getting hold of that round and saying it is either this round or it is me?

General ROGERS. They don't have [deleted].

Senator WARNER. They have got to have that?

General ROGERS. In order to enable the weapon.

Senator WARNER. That is built in. I want to study that. It is one of the fascinations of this new responsibility of mine, and I just haven't gotten down to that level.

General ROGERS. There are much greater experts in that area, Mr. Chairman, than I, and I think you would find fascinating the steps that have been taken.

Senator WARNER. But from your own personal experience, when that incoming is gone and com is gone, you know, there is somewhat of a tendency of everyone for himself.

General ROGERS. Yes.

CHEMICAL WARFARE

Senator WARNER. We have discussed the question of the intelligence with reference to chemical warfare, and I will just repeat this question and see if there is any other point you wish to make.

From your vantage point as SACEUR, do you think there is a substantial danger of our intelligence estimates, of the Soviet CW capability being too conservative in view of the inherent [deleted].

General ROGERS. No, sir. Despite the kinds of specific detail we would like, I do not believe it is overestimated. As a matter of fact, if one is—

Senator WARNER. I said underestimated I think. I said being too conservative. In other words, we were short in that area.

General ROGERS. I see. Well, I think our experience with intelligence in the past has shown that normally we underestimate rather than overestimate, and we run the risk in this area as well. There are others who have testified to the full committee on this subject of our experience showing that we most often underestimate in our intelligence rather than overestimate the capabilities of the other side. [Deleted.]

Senator WARNER. But you have seen from photography and the like, the weapons are there that can utilize that type of round?

General ROGERS. [Deleted.]

Senator WARNER. In a manner equipped with certain capabilities?

General ROGERS. They have the best chemical offensive capability in the world today, and they exercise it very thoroughly and very often. [Deleted.]

General ROGERS. There is no question in my mind that they are prepared to use them, they will use them whenever it is going to assist in the accomplishment of their mission, and we have got to be prepared to defend ourselves against them. More important we must have an appropriate retaliatory capability so as to deter their use. But should they use them, we must retaliate so that they don't continue. The authority for such use by us must rest at the highest level in those countries that possess chemical weapons.

Senator WARNER. All right. We are just about to conclude here, General.

As the Persian Gulf-Indian Ocean theater may soon come under your jurisdiction, how would you characterize our present abilities to deter use of nuclear weapons against U.S. Rapid Deployment Forces in that region?

General ROGERS. [Deleted.]

Senator WARNER. They would primarily be with the fleet?

General ROGERS. [Deleted.]

Senator WARNER. What nuclear capabilities should the RDF have over and above, say, what is in the fleet?

General ROGERS. [Deleted.]

Senator WARNER. From the same basic capability that is presently in your forces would then presumably be with the RDF.

General ROGERS. [Deleted.]

Senator WARNER. General, we will have other questions, but I think we have taken of your time very generously here, and I must say that we made a good record this morning for the work that confronts the committee and the Senate, and we are extremely grateful to you.

You have a reputation before my colleagues, and I am sure it is on the other side also, of being very straightforward and candid in your testimony. A tremendous amount of weight is attached to your words, and I thank you.

General ROGERS. Thank you, Mr. Chairman.

Senator WARNER. Dr. Wade, I understand you have a prepared statement. You can go through as much as you wish, and I have initiated a format whereby I invite the services to attend these hearings, and at the appropriate time I will call on you to offer whatever additions you may wish to put in the record, and I hope there is no reluctance to give your views should they be contrary to those views expressed by others. Only through this sort of cross-fertilization of

ideas can we reach the consensus that we have to here on the committee, and I hope that you find this format is beneficial to you. I have felt in the 2 years that I have been in the Senate that just having one service at a time occasionally works to the disadvantage of the Senate as well as the services because there are bound to be differences of viewpoints, and I hope that you freely express those viewpoints, because you certainly will assist me and my colleagues in reaching our decisions.

Dr. Wade?

STATEMENT OF HON. JAMES P. WADE, JR., ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY, AND ACTING PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, ACCOMPANIED BY LT. GEN. KELLY BURKE, USAF, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION; REAR ADM. POWELL F. CARTER, JR., DIRECTOR, STRATEGIC AND THEATER NUCLEAR WARFARE DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS; AND BRIG. GEN. NILES J. FULWYLER, USA, DIRECTOR, NUCLEAR AND CHEMICAL DIRECTORATE, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS

Dr. WADE. Thank you, Mr. Chairman. We are delighted to be here this morning. May I introduce the three principal witnesses from the services who are with me?

To my left is Lt. Gen. Kelly Burke from the Air Force. To his left is Rear Adm. Powell Carter, representing the Navy; and to my right is Brig. Gen. Niles Fulwyler soon to be a major general.

Senator WARNER. Let me just refresh my recollection now.

Dr. Wade, you have the present title as Assistant to the Secretary of Defense for Atomic Energy, and now you are the Acting Principal Deputy Under Secretary of Defense for R. & E.

RESEARCH AND ENGINEERING

The strategic area within the Department—perhaps before we get underway, tell me how it is structured now.

Dr. WADE. Yes, sir.

Senator WARNER. As I understand it, the Navy has a new section since I was there.

Dr. WADE. In the strategic area, as far as nuclear systems are concerned, there is a separate office, the Office of the Deputy Under Secretary of Defense, R. & E., for strategic and space systems. In the main, tactical nuclear programs are located in the tactical warfare program office in R. & E. I am also concerned with tactical nuclear programs in the sense that I am basically responsible, as Mr. AE, for nuclear warheads across the force. I have also been assigned this additional joint responsibility because of my personal interest in the so-called TNF program including doctrine, programs, and warheads.

As principal deputy in research and engineering, of course, I have to add to that responsibility and oversee, not only my responsibility

as the Mr. AE, but the additional responsibility of overseeing all nuclear programs in research and engineering across the board. So there is a sound basis for an integration here in nuclear programs as a whole, that is developing within this new administration.

Senator WARNER. And the uniformed officers represent sort of your counterpart in each of the three services?

Dr. WADE. They come from those program offices that provide that support, yes, sir.

Senator WARNER. And within the services, General Fulwyler?

NUCLEAR AND CHEMICAL AGENCY

General FULWYLER. I am the Director of the Nuclear and Chemical Directorate for the Department of the Army. As such, I am the focal point for the Chief of Staff and the Secretary of the Army for everything nuclear and chemical.

Senator WARNER. In the wiring diagram, you have your box, you go straight to the tree.

General FULWYLER. I like General Rogers, wear three hats. As the Army focal point for nuclear and chemical matters, I report to the Chief of Staff and the Secretary of the Army. As a Director on the Army staff, I report through the Deputy Chief of Staff for Operations and Plans, to the Chief of Staff. I also command the U.S. Army Nuclear and Chemical Agency, which is a field operating agency at Fort Belvoir.

Senator WARNER. General?

RESEARCH AND DEVELOPMENT ACQUISITION

General BURKE. In the Air Force, Mr. Chairman, we divide the responsibility for these matters into a policy area that would belong to the DCS, operations, plans and readiness, General O'Malley, whom you know, and to the research and development acquisition side, which is my responsibility. To take an example might be the GLCM program. I would have the Air Force cognizance over the national development and buying of that missile. General Blanton would be concerned with where in Europe it is going to be based, and General O'Malley about how negotiations are going to be conducted to find a home for it.

Senator WARNER. Admiral?

STRATEGIC AND THEATER NUCLEAR WARFARE

Admiral CARTER. Senator, within the Navy I am the Director of the Strategic and Theater Nuclear Warfare Division. I act as a central focal point for the translation of national nuclear policy into Navy requirements. I also act directly as principal adviser to the Secretary of the Navy and the Chief of Naval Operations for all matters relating to nuclear weapons, including international negotiations in the field of arms control.

Senator WARNER. Thank you.

Dr. WADE. Thank you, Mr. Chairman.

We appreciate this opportunity to discuss the fiscal year 1982 theater nuclear force modernization program and our TNF and chemi-

cal warfare planning with this subcommittee. I will provide an overview of the roles and missions of the theater nuclear and chemical warfare systems, and summarize our current programs.

TNF AND CHEMICAL PROGRAMS

I would like to begin by reiterating the national policy objectives which our TNF and chemical programs are designed to serve, particularly with respect to NATO, but also with respect to other theaters.

The fundamental military policy of NATO is deterrence, and if necessary, defense against any attack, at any level, on NATO territory, military forces, or vital interests. Deterrence must be effective across the entire spectrum of conflict; therefore the forces designed and deployed must cover that spectrum. NATO relies on conventional, theater nuclear, and strategic nuclear forces to deter aggression. While I will not treat strategic nuclear forces in detail here, the clear reality is that they are now and will continue to be an integral part of the framework of security we have created and built for NATO.

NATO's strategy of flexible response has long been based on the ability to respond appropriately to any level of potential attack and to pose the risk of escalation to higher levels of conflict. TNF are an essential component of this strategy. They serve to strengthen and enhance the links between NATO's conventional forces and U.S. strategic nuclear forces, and should provide the United States and its allies a credible capability to respond across the full spectrum of potential conflict.

The role of TNF and, increasingly, chemical warfare capabilities, has become particularly important because of the balance in strategic forces currently in effect, and the vigorous modernization of in-place Soviet theater nuclear and chemical forces.

IMBALANCE OF STRATEGIC FORCES

Senator WARNER. Let me interrupt a minute. You know I am very interested in the use of adjectives and modifiers by all of those dealing with this problem. The Secretary of Defense, when he appeared before the committee as a whole, said that there was an imbalance.

I am wondering if that paragraph at the bottom shouldn't read, "The role of TNF, and, increasingly, chemical warfare capabilities has become particularly important because of the imbalance."

Dr. WADE. Yes, sir. I would say that today there is an imbalance; as we look out to the future, that imbalance is getting worse.

Senator WARNER. So really, I am not trying to criticize you, but that is exactly what you mean, it is the imbalance of strategic forces currently in effect.

Dr. WADE. Yes, sir.

Senator WARNER. Thank you.

Dr. WADE. Under these conditions, our programs need to insure that the Soviets do not miscalculate either our purpose or our capabilities. This is particularly important with respect to NATO's chemical warfare capabilities. Within the best estimates of our intelligence assessments, there is now a significant and adverse asymmetry with regard to these capabilities. The Soviet Union and the Warsaw Pact

are better prepared to conduct offensive chemical operations and to protect their armed forces against the use of both nuclear and chemical weapons. The importance the Soviets attach to this type of warfare is suggested by the [deleted] personnel assigned to divisional and nondivisional chemical warfare units. [Deleted.]

The addressal of these broad deterrence objectives and problems with specific programs, system acquisitions, tactical doctrine and employment policy is, of course, a most challenging task and subject to widely divergent views. The United States must take the lead within NATO in determining the proper course to follow. To my mind, there is no single "best" path or "optimum" solution to achieving the stated deterrence objectives. On the other hand, there are some minimum collection of capabilities and policies which NATO must possess to make her adversaries believe that deterrence is not a hollow threat.

Credible deterrence is composed of two equally important parts. The first is the demonstrated will and capability to deny objectives; and the second is the demonstrated will and capability to inflict punishment. Possessing only one half of this deterrent equation is not enough. Our adversaries may accept the risk of being denied his objectives if we cannot punish them, or they may accept the risk of punishment if we cannot deny them the objectives. Thus, to me, the perennial argument of "warfighting" versus "deterrence" in Europe is based on a flawed logic. A warfighting capability is a fundamental and integral part of the deterrence. The Soviets recognize this and posture their forces accordingly. NATO must embrace this logic and the United States must work at all necessary levels to develop an understanding on this issue. We must not fear war. We don't want to fight a nuclear or chemical battle, but we must be prepared to do so if such a battle is to be deterred, as we must also be prepared to carry the battle to our adversary's homeland.

Senator WARNER. I want to interrupt just a moment.

CHEMICAL WARFARE

General, I am going to ask the Department of the Army to do a little research for me with respect to the experience in World War I with chemical warfare. I am thinking now that at some point in time I have got to conduct a hearing and bring before the hearing, before all the television cameras, those few remaining veterans I can find that have actually experienced attack in the trenches.

For those of you who came later, I mentioned my father was in the trenches. He told me many, many times over his experience when these attacks occurred and the complete disorientation of the troops, the breakdown of the command structure, and all sorts of stories that linger on in my mind, and I want the American public, to the extent that any living veterans can, to share those stories so that we can begin to build a foundation in the public relations world which we have got to do to turn back this resistance.

Would you help me in that task?

General FULWYLER. Yes, sir. As a matter of fact, we have under way now, I believe, an awareness study which we could expend to document some of the experiences and lessons that were learned during World War I.

Is that correct, Colonel Robinson?

Colonel ROBINSON. Yes, sir. We have initiated an awareness study.

Senator WARNER. How far along are we in that?

General FULWYLER. I think we just got under way, sir, but I will check and let your staff know the status and what we project as a completion date. We will provide your staff a copy of our study, when completed.

Senator WARNER. I will consult with my colleagues on this committee, but I think we can put together a fairly dramatic hearing for the American public.

You know, memories are growing dim. General Rogers mentioned this morning, with the new generation of young men in Germany, in service of the Germany Army and our Army, they were not born, they were not here. They were not here at the time of World War II, and of course, there are so few people around that have any recollection about the gas attacks in World War I, I want to bring that record up to date and make it public.

I would also like, to the extent possible, to make it possible to draw on the experience of people in the United Kingdom and the Federal Republic of Germany. There have got to be some of those around that can come before the public on television, which educates everybody now, and just tell their stories of what happened.

General FULWYLER. I must agree, sir, that in working in the chemical problem for the Army and I am not a chemical officer—I am a line officer on duty who became chemical officer for the Army—I have found that public perception is one of the greatest problems I face. For many reasons the public view chemical as something more abhorrent than nuclear or anything else, but they don't realize or understand that today our chemical posture is [deleted] and we simply must deal with it. That is why I've initiated the awareness study.

Senator WARNER. That's right, and it is absolutely unfair to have an All-Volunteer Force and put these young men, and to the extent women are anywhere near the front, in positions where they could suffer the consequences of an attack, [deleted].

General FULWYLER. Each week I get nearly 25 letters, some weeks more, some a few less, from all over the United States talking about why we are still in the chemical business and requesting that we do nothing in this area or get out of what little we are trying to do. That is why we need to attempt to change the public's perception of chemical warfare.

Dr. WADE. Mr. Chairman, may I offer one note of caution? We should think through here, in recalling, what General Rogers said this morning, that one of the problems we had with needed support toward the so-called neutron bomb, or the enhanced radiation bomb, was the fact that we made or allowed so much publicity to the fact that this is a very new, different type of warhead. Yet it is still a nuclear weapon. And General Rogers was suggesting that perhaps if we could move ourselves back in time, [deleted].

So the thing I think we need to be sure of here is that we don't overplay our modernization efforts for CW, but rather try to overcome the adverse public perception, both here and abroad, regarding this issue. I think we have got to be careful with how we resolve the public perception problem.

Senator WARNER. We have the cart and the horse, but can't get the money for the equipment.

Dr. WADE. Yes, sir.

Senator WARNER. We will try again anew in Congress, but we weren't successful last year.

Dr. WADE. I believe you will see in our new programs that a very well supported and thought out program will be presented to you in the near future.

Senator WARNER. Do you think it provides a basis for being persuasive in the Congress?

Dr. WADE. It should be a big start, sir. I think, although we have turned on added [deleted] requirements to further identify the threat, we still can present a case in which the potential impact on the U.S. Forces is dramatic, and [deleted] demonstrate that the Soviet capability is truly in being today.

Senator WARNER. You and I will debate this, but I will certainly give the Secretary of Defense every opportunity to convince me.

Dr. WADE. I think your idea of initiating a program to change the public perception is a very good one. We must be sure that we think through all the pieces.

Senator WARNER. I must say I claim a little bit more expertise in the public relations area than you fellows. I was the one in the well of the Senate with Senator Jackson and Senator Stennis. We were the only three in the Senate, except for one other Senator who was opposed, and we lost.

Dr. WADE. I understand that. And I will also note, I don't believe we gave you earlier the support from the Department of Defense that we should have.

Senator WARNER. Well, it came up rather quickly. I am not faulting anybody. But I am becoming convinced that we have got to do something. This is just an idea that I personally am going to study, and then we will have to decide what we do as a committee. I want your criticism—your objective criticism—about the direction which I as chairman am proceeding.

Dr. WADE. Our joint purpose is to handle and solve this problem. It is a very serious problem.

To achieve such a posture will require frank and explicit, and as appropriate, quiet discussion with our principal allies. We should assume the leadership—and I would like to underline that point, leadership—and go to our allies with a clear view of what we have in mind. But we must have sufficient flexibility in our approach to insure a solid consensus in the outcome. We need to develop an integrated strategy for TNF and chemical warfare, as well as an integrated theater nuclear and conventional warfare strategy. All three pieces fit together. Such a strategy must account for the evolving global challenge, arms control possibilities, technological opportunities, resource constraints, alliance realities, and most importantly appreciate the impact of the revised status of the strategic force balance. We should not underestimate the complexity and the difficulty of this issue or its impact on our overall defense posture and political interests. The process for defining the purposes of TNF and chemical warfare in this context should begin with determining the degree to which our various strategic force alternatives would place reliance on TNF to do

two different jobs. That is: No. 1, deal with the threat of an overwhelming non-nuclear attack; and No. 2, deal with the threats of tactical nuclear and chemical attack. Today, reality forces us to focus on the second in order of priority.

DEALING WITH THE THREAT

In Europe, our current policy is to do both. For the fleet, our policy for sea control TNF is [deleted] TNF and chemical warfare policies for other theaters, [deleted] are under review, but not yet developed and national level policy for development of offensive chemical warfare needs to be formulated.

FIVE AREAS OF IMPROVEMENT

As I view the technical and programmatic issues regarding modernization of TNF and chemical warfare, there are five areas requiring improvement. First and most important, we must continue to further improve the survivability of our forces, with particular focus toward the aggregate force since this is the basic prerequisite to establishing their credibility.

Second, we need to insure that there is an adequate, survivable and enduring supporting C³I system.

Third, we need to achieve a balanced mix of forward-deployed theater nuclear forces, including battlefield, theaterwide and sea control mission areas.

Fourth, we must [deleted].

Finally, we must continue our efforts to upgrade the security and safety of our deployed weapons.

I will briefly highlight the key programs that address these areas. The accompanying chart covering TNF provides a framework for this review. The threat growth has continued apace.

THEATER NUCLEAR AND RELATED FORCES

TNF MODERNIZATION

[Deleted.]

For example, there are now [deleted] operational SS-20 launchers, [deleted]. I will not dwell on the threat today, but suffice it to say, it is substantial both in its nuclear and chemical dimensions.

Senator WARNER. Excuse me. What are the chemical dimensions of that? I may have missed that on the SS-20.

Dr. WADE. The chemical dimension is the fact that most of their tactical missiles like the Sea and the Frog both have a conventional, a nuclear, and a chemical capability, so in that one sense, the Soviet force structure is integrated.

Senator WARNER. Thank you. Go ahead.

GLCM AND PERSHING II

Dr. WADE. Our two priority programs in the theaterwide mission area are the GLCM and Pershing II long range TNF systems, agreed to by NATO in December of 1979. The modernization decision, of central importance not only for its military effects, but also as a symbol

of the political determination and cohesion of the alliance, is currently being implemented. The most critical, if not the most complex, aspect of implementation is the achievement of the planned IOC dates. Initial deployment for both systems is scheduled for the end of 1983 in the United Kingdom (GLCM) and the Federal Republic of Germany (Pershing II), and early [deleted] for GLCM in Italy.

Major component testing for the Pershing II missile has been successful and the first flight test will occur in April of 1982. Pershing II's will replace all the U.S. Pershing IA's in the Federal Republic of Germany by the end of 1985.

In May of 1980 we completed the first flight test of a GLCM from an engineering model. While we are making some technical adjustments to the GLCM program schedule, we are pressing ahead with determination to meet the late 1983 IOC and plan to deploy 160 GLCM's in Europe by the end of fiscal year 1985, and 464 by the end of fiscal year 1988. A significant portion of the construction of GLCM facilities will be funded under the NATO infrastructure program [deleted].

As an integral component of the December 1979 modernization decision, NATO Ministers committed themselves to TNF arms control negotiations with the U.S.S.R. The first round of United States-U.S.S.R. preliminary exchanges on LRTNF was held in Geneva during October-November 1980.

DEFENSE POLICIES AND PROGRAMS

Upon completion of this initial exchange, both the United States and the Soviets expressed their intention to maintain communications on arms control issues during 1981. As you are aware, the United States is currently reviewing each of its defense policies and programs, and has expressed its willingness to participate in meaningful arms TNF arms control as part of this comprehensive review of U.S. nuclear control negotiations with the Soviet Union. We are now reviewing TNF arms control as part of this comprehensive review of U.S. nuclear arms control policies. The United States remains committed to both the modernization and arms control provisions of the December 1979 NATO decision.

The tactical bomb stockpile which supports NATO and U.S. worldwide requirements for theater use is also being significantly upgraded. The deployment to Europe of [deleted] is continuing. These systems have enhanced safety and security features. The Department of Energy has also requested funds in fiscal year 1982 to begin a most important stockpile improvement program which will retrofit the older versions of B-61 bombs with enhanced security, safety and command and control features. All forward-deployed tactical B-61 bombs will be upgraded by [deleted] under this DOE/DOD program.

In the battlefield mission area, there are four important programs underway.

NUCLEAR ARTILLERY PROJECTILE

A new 8-inch nuclear artillery projectile, now in engineering development, with [deleted] IOC will provide needed improvements. For example, it does not require field assembly; eliminates the need for

a spotting round; has increased range from 18 kilometers to 29 kilometers; offers [deleted] enhanced radiation reduced blast (ER/RB), and includes improved fuzing, safety devices, and security features. [Deleted.]

A new 155 millimeter nuclear artillery projectile is in an earlier stage of engineering development. This weapon will also provide improvements in range, accuracy, yield, fuzing and denial disablement features. This program was deferred so no funds are included in the current fiscal year 1982 budget request, but the new administration is reviewing this decision.

LANCE SURFACE-TO-SURFACE MISSILE

The nuclear Lance surface-to-surface missile is currently deployed with United States and other NATO forces.

Senator WARNER. An interruption on that. The advent of reviewing the decision, is it possible we might get it in a supplemental?

Dr. WADE. Yes, sir.

Senator WARNER. Thank you.

Dr. WADE. Production of improved Lance warheads is under way and will be completed by [deleted]. Enhanced radiation/reduced blast features can also be incorporated in these warheads.

CORPS SUPPORT WEAPONS SYSTEM

The corps support weapon system (CSWS) is an Army artillery missile system with the mission of interdicting surface-to-air missile systems and second echelon enemy ground forces [deleted]. The corps support weapon system is expected to be capable of delivering conventional antimaterial, antiarmor, nuclear and chemical warheads. We currently envision that CSWS will replace the current Lance. The Defense Advanced Research Projects Agency has been working on the assault breaker antiarmor guided submunition, and the Air Force has been developing the Pave Mover radar required for target acquisition. A series of competitive firing demonstrations is scheduled for 1981. At the same time, the Air Force is studying an air-launched version of Assault Breaker to be demonstrated in 1982. These demonstrations will clarify a number of technical issues concerning both the Assault Breaker concept and the Pave Mover and submunition technologies. The fiscal year 1982 budget request contains funds for the R. & D. for the system. If successful, this program could provide extremely high leverage in dealing with the Pact threat.

I would like to underline the words "extremely high leverage." It is a very important program.

SEA CONTROL MISSION

The Sea Control mission area includes fleet antiair, antisubmarine and antisurface ship systems. Current systems include Asroc, Subroc, Terrier, and air-delivered [deleted] depth bombs. In addition, carrier-based nuclear bombs, although normally included in theaterwide systems, contribute to sea control through their ability to counter hostile surface ships. As part of our continuing assessment of the future role and utility of naval nuclear systems, we have initiated,

in conjunction with the Department of Energy, a feasibility study to define a potential warhead for the ASW standoff weapon. This is a multiplatform weapon to be deployed in the late 1980s with either a nuclear warhead or an advanced lightweight torpedo as a payload. We have reviewed and established the requirement for continued development of a nuclear warhead for the standard missile, SM-2, for fleet air defense against the Backfire-delivered cruise missile threat.

TNF S³

The TNF S³ program. As we continue to pursue more survivable nuclear forces, we must also concern ourselves with the peacetime environment. We therefore have been placing emphasis, in coordination with the Department of Energy, on measures to insure that our TNF systems remain safe and secure. Some of the improvements now being included or considered for our new systems are, one, insensitive high explosive to reduce the consequences of accidental or unauthorized detonation of the weapon's high explosive; number two, an improved permissive action link (PAL); three, enhanced electrical safety features and packaging intended to reduce the potential for accidental arming or defonation through abnormal environments; four, nonviolent command disable systems that can render a weapon inoperable [deleted] and five, continuing storage site security upgrade and transportation safety and security features which are intended to defend against terrorist action. In addition, we are also continuing efforts to enhance the wartime survivability of TNF; the GLCM hard shelter program is one example.

C³

The C³ program. We have a three-phase program underway to correct the deficiencies that exist in the C³I systems supporting our theater nuclear forces. The current systems generally have [deleted].

In the first phase of our improvement program, which should be completed by the end of fiscal year 1981, we have focused on upgrading the critical communications links to the United States [deleted] units in Europe, and this is addressing, Mr. Chairman, your comment to the General this morning as far as what happens in reference to the communications links. We are extending the terrestrial, voice conferencing system [deleted] and are adding a [deleted] capability to the system. We are also upgrading the high frequency radio equipment at the net control stations [deleted].

HIGH FREQUENCY RADIO

In phase two, which basically extends from fiscal year [deleted] we are building onto the phase one high frequency radio enhancements by adding new, reliable mobile radio equipment [deleted]. We are also deploying approximately [deleted] to these sites to provide a reliable, backup communications capability.

Although the above improvements will [deleted]. To meet this objective, we have recently completed a new comprehensive plan for a series of longer term system improvements. Most of these initiatives in this plan will form the basis for our phase 3 program beginning in fiscal year [deleted].

CHEMICAL WARFARE

The last area I would like to discuss is chemical warfare, which may very well be our [deleted] tactical mission area in the 1980's. Even though the United States is formally committed to the policy of no first use of lethal or incapacitating chemical agents by adherence to the Geneva protocol of 1925, and seeks a complete and verifiable ban of lethal chemical weapons, it has not eliminated the threat and today U.S. forces are facing a chemical threat from an adversary which is, in our best judgment, the best prepared and trained nation in the world in the use of chemical warfare. As stated earlier, the Soviet Union possesses a formidable offensive capability to wage chemical warfare for an extended period, and their leadership continues to devote significant resources to research, development, and procurement of more advanced chemical weapons and equipment.

BIOLOGICAL WARFARE

Senator WARNER. Let me interrupt at this point.

We use the terminology chemical warfare. What about biological warfare? Do you consider that an integral part of this whole subject, or do we split it out?

Dr. WADE. It was an integral part until we destroyed our biological warfare stockpile in the early 1970's. Since then our program has been limited to defense measures. In 1975, the United States ratified the Biological Warfare Convention. The U.S.S.R. is also a party and was to destroy all stocks.

Senator WARNER. To do what?

Dr. WADE. To destroy all biological stocks.

[Deleted.]

Senator WARNER. [Deleted.] So I come back, whether or not we should consider it an integral part.

Dr. WADE. I think that is an appropriate point, sir.

I have one comment, and I might ask General Fulwyler to address this. I think biological warfare is much more difficult to integrate in an operational sense vis-a-vis chemicals and nuclear weapons, and as far as my own personal judgment is concerned, it is not as viable a weapons system as these other components. If we are not prepared for it, we can get surprised by it; then the impact can be significant.

Except for limited R.D.T. & E. efforts in the protection area, we certainly have devoted very little effort to this area over the last several years.

They also have a large and well-equipped dedicated chemical force, and all units within their armies train extensively for chemical warfare, including the use of live agents in training. It is our desire to deter their use of this capability. However, we and our allies together must be realistic and prepared for such an eventuality.

Given this asymmetry between United States and Soviet chemical warfare capabilities, other shifts in the conventional and nuclear balances, and signs of Soviet use of chemical warfare directly or through surrogates, we must promptly upgrade our own retaliatory capability.

Our chemical warfare program today places primary emphasis on the protection of our forces. The program for development of pro-

fective equipment includes improved individual clothing, therapy, and prophylaxis against chemical agents, as well as improved decontamination equipment, chemical warfare agent detectors and training systems. We plan to expand our efforts with academia and industry in fiscal year 1982 to broaden the technological base to support defensive materiel improvements.

Our offensive chemical warfare program contains funding in fiscal year 1981 for modifying a facility at the Pine Bluff Arsenal to provide the option to produce binary chemical munitions. Funds are planned in fiscal year 1982 for maintenance of the current deterrent stockpile, to include R. & D. of chemical agents and a binary bomb, commonly known as Bigeye. Detailed analysis will also be conducted concerning the types and quantities of chemical munitions necessary to provide an adequate deterrent posture.

Senator WARNER. Let me interrupt you for a second. That first sentence of the last paragraph, our offensive chemical warfare program contains funding in fiscal year 1981 for modifying a facility at the Pine Bluff Arsenal to provide the option to produce binary chemical munitions.

Jim, that is simply structure?

Mr. SMITH. Yes, sir, that is the \$3.15 million.

Senator WARNER. And that is what you are referring to?

Dr. WADE. That is what I am referring to here.

Senator WARNER. And all the equipment, that was \$19 million, that was stripped out in the congressional process.

Mr. SMITH. It was not in the budget of the department when it came over here. The money for the facility was added by the Congress. Mr. Ichord initiated the action in the House.

Senator WARNER. Now, let's take 1982. What is in the 1982 request, maintenance of the current deterrent stockpile. Anything else?

General FULWYLER. We have put in for the binary again, sir, the \$19.9 million. The additional \$0.9 million is to cover inflation.

Senator WARNER. So the \$19 million is back in this for equipment.

General FULWYLER. Yes, sir, and that is to equip the plant that we have already gotten approval from Congress.

Senator WARNER. So in 1982, what is in the present Carter submission? Zero?

Dr. WADE. Zero.

And, Mr. Chairman, within the supplemental program, it is basically in its final stages, as of now, that issue of the \$19.9 million is being reviewed, and we should know what the decisions is on that very shortly.

Senator WARNER. All right, so I can get it clear in my mind, nothing in the request from President Carter under consideration in the supplemental, and the degree to which it is being considered is just the \$19.9 million for the machinery.

Dr. WADE. That is correct and I believe it is reasonable to say it is about approved as part of a very substantive add-on to the whole CW mission area, both defensive, offensive and demil. That was what I alluded to in the earlier point I mentioned, that the new administration review of the CW across the board is making a very major shift toward getting on with this program.

Senator WARNER. So there are other items in the supplemental.

Dr. WADE. Yes, sir.

Senator WARNER. That reflect this added emphasis by the new administration.

Dr. WADE. Yes, sir.

Senator WARNER. Thank you.

MUNITIONS BEING CONSIDERED

Dr WADE. The munitions currently being considered for the near term are the 155-millimeter artillery shells and the Bigeye bombs. In the longer term, 8-inch artillery shells, [deleted] and missiles are possibilities. This action will provide a basis for future decision on binary chemical weapon production.

Now, in closing, considering the payoffs in terms of deterrence and military capability, the cost of theater nuclear forces and CW capabilities is modest indeed. On the average, we spend less than [deleted] a year for all the costs of TNF, to include operating and maintenance of the forces, modernization, the R. & D. and procurement. We do not anticipate extraordinary costs in providing the necessary TNF and CW capabilities in the years ahead. However, this will depend on many factors, not the least of which are further assessment of the Soviet programs now entering service and our ability to formulate a plan for NATO in concert with our allies.

Thank you, sir.

Senator WARNER. All right. I would like to, before we go to questions, ask each of our military departments to add whatever commentary they wish and we will just start, for ease of reference, with General Fulwyler.

General FULWYLER. Thank you, Mr. Chairman.

Dr. Wade has covered basically most of the things that I wanted to say. However, let me emphasize a few points from the Army's perspective, and I would like to do that from both the chemical as well as from the nuclear viewpoint.

TNF MODERNIZATION PROGRAM

When people talk about deterrence as Dr. Wade did, you always hear the words "will" and "capability," and I certainly agree that those are essential ingredients of deterrence. But as you well know, all the will in the world won't do you any good unless you have the capability, and that gets to the heart of the Army's TNF modernization program. I believe the fact of the matter is that today our current deployed TNF is fast losing a lot of its capability. In fact, its capability is already questionable because the components are aging and there are numerous problems associated with them. It represents a technology that is 20-some years old, and that is the essence of our problem and that is why we are attempting to implement the programs that Dr Wade mentioned.

The battlefield programs are essentially the 8-inch nuclear projectile which is on track and we will start deploying that new weapon system early [deleted]. For the Army, that represents a very important program.

The new 155-mm nuclear projectile is referred to as the W-82. Since I have been working in this business for some 4 years, I can best characterize the 155 as an endangered species, because each year we have had to fight to save the program.

Because of that, that program has been repeatedly delayed and in fact today we don't have any money in the fiscal year 1982 budget for that program. It was deleted by the Carter administration in December.

I feel that it is a very important program and I fully support General Roger's statement on this.

Senator WARNER. Let me interrupt a moment.

I fully admit that my background is limited in this area. That is the reason I'm going into such depth in these hearings.

First, what is integral in the Army forces today? I think I know, but I want to go over it.

General FULWYLER. Nuclear, sir?

Senator WARNER. Yes, your TNF.

ATOMIC DEMOLITION MUNITIONS

General FULWYLER. First we'll start on the defensive systems, which include atomic demolition munitions. These are small and man portable. They are hand emplaced and can be used to delay and disrupt enemy movement or to channelize the enemy to locations where he can be destroyed.

We have the Nike-Hercules, which is principally a surface-to-air missile system although it also has a surface-to-surface capability.

For the battlefield systems, we have the 155-mm howitzer and the 8-inch howitzer. Additionally we have the Lance range missile which has a range of a little over [deleted] kilometers.

In the medium-range TNF, we have the Pershing 1A system which has a range of less than [deleted] kilometers.

Those are the Army's current systems.

Senator WARNER. Describe the characteristics of some of these rounds. What area of damage?

General FULWYLER. All right, sir.

As an example, our current 155-mm round has a range of about 14 kilometers. It has a yield of [deleted].

The current 8-inch has a range of about 18 kilometers and a yield of [deleted] up to [deleted].

We have the Lance, which has—

Senator WARNER. Let's take the 8-inch right now. That has a firing range of 14 to 18 kilometers?

General FULWYLER. Yes.

Senator WARNER. And yields [deleted]. Apparently there is a different warhead you have?

General FULWYLER. For the current 8-inch we have one mod with yield of [deleted] and a second mod with a [deleted].

Senator WARNER. Now, what level of damage is inflicted? Suppose you have a tank attack.

General FULWYLER. All right, sir. Again, we're talking about the current round?

Senator WARNER. That's right.

General FULWYLER. I don't recall exactly what the lethality is, but it is not all that significant. I can find that for you, give you the damage radii for personnel in tanks.

Senator WARNER. Maybe there is somebody in the audience—

General FULWYLER. We are talking about the current round now—

Colonel MURRY. For the current W-33 against personnel protected in tanks, it will produce immediate transient incapacitations radiation casualties out to a radius of [deleted] meters from the center of the burst; damage to the tanks themselves, moderate damage to the tanks, out to a radius of about [deleted] meters.

That is with current highest yield of the 8-inch weapon.

Senator WARNER. So you said [deleted] meters?

Colonel MURRY. Yes, sir.

Senator WARNER. Roughly [deleted].

Colonel MURRY. Yes, sir.

Senator WARNER. That is a total diameter, taking into consideration terrain, valley, all that sort of things, if it were on a plain, a flat area coming in, about [deleted].

General FULWYLER. That is radius.

Senator WARNER. [Deleted] radius—it would be about [deleted] in diameter.

And that would incapacitate all the personnel in the vehicles?

Colonel MURRY. It would immediately incapacitate them all within 5 minutes. They would recover some capacity after a period of 45 minutes to 2 hours, but the capacity would continue to degrade from that time until they eventually died. That is a lethal radiation level.

Senator WARNER. Lethal radiation level?

Colonel MURRY. Yes, sir.

Senator WARNER. What is the residual in that area? Do you visualize a tank attack coming and dropping one of these things and you take out a [deleted] cross-section. No other vehicles can go into that area for what period of time without being impaired?

Colonel MURRY. I don't recall the exact figures at this time, sir, but there would be a small area directly below the burst probably not much greater than about [deleted] across where the radiation would be very high for a period of 2 or 3 days. After that period of time, it would be safe to enter for very short periods of time, and then after a much longer period of time, the radiation level would be down below the serious risk level.

Senator WARNER. So if the enemy were coming in through a choke point, a geographic choke point, you would lay [deleted] rounds down there, you would pretty well seal off that avenue. Is that right?

Colonel MURRY. No, sir, because he could travel through that at a high rate of speed and with his collective protection systems on his armored vehicles, he would be able to move through that area of contaminated terrain.

General FULWYLER. One of the current problems we have with our current rounds, Mr. Chairman, is that some people visualize that [deleted] 8-inch or 155-mm rounds can decimate a large, armored formation. That simply is not true.

Now, certainly you are going to create damage in certain areas, but as far as [deleted] rounds destroying, for instance, an armored division—that is not true.

When I was at SHAPE we were doing calculations on this, and we came up with a rather arbitrary figure. For instance, in our scenario it would take maybe [deleted] rounds—

Senator WARNER. Of 8's or 155's?

General FULWYLER. That would be a combination of both depending on what formation the armor is in. Of course, again that points up—and I do not want to get into it—the value of the ER weapon. With an enhanced radiation capability, it extends the area against the personnel in armor.

Senator WARNER. Now, let's drop down to the 155. That, again, has a comparable range—well, there is one of them here that has [deleted].

General FULWYLER. That is the new M-198 howitzer and the new rounds.

Senator WARNER. And you get [deleted].

General FULWYLER. That is correct.

Senator WARNER. So that is [deleted].

General FULWYLER. That is correct.

Senator WARNER. Then the Lance?

General FULWYLER. For the Lance we have weapon yields of less than [deleted]. It is [deleted] and we will be starting on the production of the new Mod 4 for it very shortly this year.

Senator WARNER. Now, looking at that and translating, we dropped a 13 KT on Hiroshima. You have got here [deleted]. The [deleted] is a [deleted] warhead.

General FULWYLER. Yes, sir.

Senator WARNER. That laid into the proper pattern could cause a little havoc?

General FULWYLER. Yes, sir. It would certainly give someone a real headache.

INCREASED RANGE OF LANCE

Again, the advantage of the Lance is because of its increased range. However, as Dr. Wade mentioned, we are looking at what we call the corps support weapon system. We are considering some type follow-on Lance system to do this, to reach out even further to attack the second echelon, which we feel is essential and also which we feel is a very lucrative target for such a weapon as this.

Senator WARNER. Then we drop down to the Pershing and we have got a substantial range there.

General FULWYLER. Yes, sir. The new Pershing, known as PII will have more than double the range of the PIa out to about [deleted] kilometers, and will have yields that go from a [deleted].

Senator WARNER. Even the Pershing I has a [deleted] warhead, [deleted].

General FULWYLER. Of course, the current PIa, has a range of slightly over [deleted] kilometers, and also it has a CEP or circle error probable that is fairly large. The CEP is between [deleted] meters where the new PII is going to have a greatly improved accuracy in the vicinity of [deleted] meters.

Senator WARNER. The CEP?

General FULWYLER. Yes, sir.

Senator WARNER. So you could drop that one [deleted].

General FULWYLER. That is exactly right, sir.

SOVIETS' COMPARABLE WEAPONS

Senator WARNER. Now, what have the Soviets got in a comparable range of weapons to throw back?

General FULWYLER. They have a large number of different systems. For instance, in the decade of the 1970's, their TNF deployments were significant. They made a tremendous improvement that has been continuous.

For instance, it is estimated, they put about 12-13 percent of their annual GNP in their defense budget each year and consequently they have been able to put into the field a number of systems.

For instance, on the short range, our artillery range, they outrange us altogether with the various systems and missiles. They have some heavy artillery, too. The [deleted] and we now give them a nuclear capability for that.

With those ranges, they can stand off and outgun us in range.

Senator WARNER. So I judge that when General Rogers said "imbalance," it is clearly there in the TNF?

General FULWYLER. Yes, sir.

SERIOUSNESS OF IMBALANCE

Senator WARNER. How serious is that imbalance? Has anybody tried to qualify it? Is it [deleted]? What is it?

Dr. WADE. It is [deleted] in general terms, Mr. Chairman.

Senator WARNER. Across the board in the various systems, [deleted].

Dr. WADE. The real point is they have escalation dominance control at each one of those levels, and I think that is a significant problem.

Senator WARNER. You mean to range?

Dr. WADE. At each one of the ranges, yes. They have basically a preponderance of power, sir; when you ask yourself the question, "Do I want to raise the escalation level," you quickly run out of any eagerness to do that.

Senator WARNER. I see your point. If you start matching weapon for weapon, every time we escalate, their weapon is not only bigger in warhead, but better in the range, and maybe in accuracy. We do not know.

General FULWYLER. And throw weight.

Dr. WADE. And also as far as the numbers are concerned.

Senator WARNER. As far as the numbers are concerned. I see.

CHEMICAL WARFARE VULNERABILITY

General FULWYLER. Mr. Chairman, too, that brings up a key point which Dr. Wade alluded to in his statement which has been one of concern to me, based on my NATO experience. And that is the fact that we do not have a credible CW capability. [Deleted] in the past, that if the other side uses chemicals, we will [deleted].

Well, when the balance as we look at it today has deteriorated, which I refer to as the shifting balance, [deleted] is not credible in my opinion.

Senator WARNER. Right.

Well, thank you for bearing with me.

General FULWYLER. So on the theater nuclear force side, sir, I will close. I feel our No. 1 priority is the W-82, the 155. We need that.

I underscore both what Dr. Wade said and what General Rogers said this morning. On the CW side, I believe that CW represents one of the greatest vulnerabilities to this country today.

We have made a lot of progress in the last couple of years, but we still have a long way to go.

I think it is absolutely necessary that we proceed with the binary. We have a stockpile that is aging and does not really constitute a credible deterrent today.

The best way we can insure we do not get involved in a chemical war is to be prepared to fight one, [deleted].

Senator WARNER. When you say proceed with the binary, I am sure you are giving me your personal, professional opinion?

General FULWYLER. Yes, sir, I am.

Senator WARNER. Because as far as I have learned from the witnesses this morning there is no budgetary consideration to consider manufacture of the weapon itself.

I mean, I visualize first structure, then machinery and then the third phase is production

Is that under consideration?

Dr. WADE. No, sir. What you have stated is correct. We are moving to build the facility. We do not now have to make a firm decision as far as production and thereafter deployment, but I would also note, as General Rogers said this morning, that that single step, moving toward building the facility, is basically a green light as far as facing up to the reality of the situation that we now see.

BINARY WEAPONS

General FULWYLER. And I want to reiterate on the binary question sir, it is my position and it is also the Army's position. We have submitted the request for the money for the binary to be included in the supplemental. I do not know what the outcome of that will be.

Senator WARNER. The production of a binary weapon.

General FULWYLER. What I am talking about now is the \$19.9 million to provide the equipment for the facility that has already been approved which will give us the capability of producing binary weapons.

Senator WARNER. I have to go back over that and get it clear. There is a structure to be put up, and we have given the money.

The next is the internal machinery with which to do the production. That is definitely under consideration.

The third phase is the actual acquisition of the chemicals and so forth to put this binary shell together.

General FULWYLER. We have not yet reached that last point.

Senator WARNER. The Army has not addressed in their petition to the Secretary of Defense moneys for that?

General FULWYLER. That is correct. That will involve part of the production decision. We have not reached that point yet.

Senator WARNER. Have you completed your observation?

General FULWYLER. Yes, sir. Thank you very much, Mr. Chairman.

Senator WARNER. General Burke?

General BURKE. Yes, sir.

AIR FORCE'S CONTRIBUTION TO TNF

I will talk a little bit about the Air Force's contribution to theater nuclear forces.

You no doubt will recall that in days gone by we used to have medium-range ballistic missiles, such as the Thor. We also had some primitive cruise missiles called Matador and Mace that were once in our theater nuclear forces.

But all of those have been retired long ago and the only systems that we have today are aircraft that, in the jargon, are called dual-capable aircraft.

I just wanted to introduce you to that term. The thought is that any airplane that is designed to carry an ordinary bomb can, with the proper wiring and certification, also carry a nuclear bomb.

Yet we do not need all of the airplanes that we have to have that capability, so some are dual-configured and some are not. Specifically that we have today are aircraft that, in the jargon, are called dual-capable aircraft.

Senator WARNER. The F-4's, F-111's and F-16's?

General BURKE. Yes, sir.

Senator WARNER. Now, when you say "capable," is that all mods of of this aircraft, or just some?

General BURKE. Virtually all. [Deleted.]

Senator WARNER. So.

General BURKE. Yes, sir.

Senator WARNER. And my recollection of what we have in inventory today are—what? I think 1,400. Do we not have 1,400 operational for us?

General BURKE. That is about right.

Senator WARNER. Of that, about how many.

General BURKE. [Deleted.]

Senator WARNER. Then we go to the F-111. That is across the board?

General BURKE. Yes, sir.

All models of the F-111 are nuclear capable. There are about 250 of them with approximately an additional 100 used as trainer and backup aircraft.

Senator WARNER. Then we go to the F-16?

General BURKE. They are just coming into the inventory. We planned to buy 1,388 of them.

Senator WARNER. I visited them and was very impressed. It was my first chance to kick the tires on that aircraft. Not only the aircraft, but the people out there are just super.

General BURKE. I had lunch the day before yesterday with General Ivry of the Israeli Air Force and he also told us of his comments. He was very pleased with the F-16.

We need to make a couple of improvements there, but it is basically a fine airplane-engine match.

Our allies—

CLASSES OF PLANES

Senator WARNER. Let's go over the classes. The 4's, 111's, 16's and that is it?

General BURKE. That is it.

The F-15's are air-to-air fighters and do not normally carry bombs. A-10's carry bombs but they do not really have the speed and characteristics you would want for this mission.

So that is how we wind up where we are.

Our allies also have dual-capable airplanes in Europe, including allies that do not have any nuclear weapons of their own. We, of course, provide the nuclear weapons to them and retain the key, the so-called PAL that we talked about.

Our airplanes, obviously, can go to any theater, but most of the focus is naturally to Europe and right now the U.S. Air Force has [deleted] airplanes that are dual capable that are either in Europe or that are designated to go to Europe, that have that potential.

Of those, the F-111 is by far the best for that role. It has a range, a radius, of about [deleted] miles. It would get you just about to [deleted].

It could carry three bombs. By contrast, the F-16 would have a radius of about [deleted] and an F-4 a little less than that.

Senator WARNER. That is on range?

[Deleted.]

Senator WARNER. What are the characteristics of the ordnance bomb?

ORDNANCE BOMB

General BURKE. The basic bomb is a B-61 bomb which has a yield of about [deleted].

Senator WARNER. [Deleted.]

General BURKE. That is the highest. It has several lower, [deleted]. And combined with an F-111 accuracy, that is quite a good yield/accuracy combination. That would be adequate for a hardened silo or would destroy a fair sized city. It is quite an impressive weapon.

The Air Force is responsible for about [deleted] nuclear bombs that are in Europe for our own forces and about [deleted] of them are set aside for use of the allies.

Again, with the United States having the ultimate—

Senator WARNER. A total of about [deleted] of which about [deleted] are on a standby basis for use by the allies?

General BURKE. For use by the allies, on day-to-day alert in Europe. There are about [deleted] tactical fighters sitting on alert right now with nuclear weapons and would, again, in the jargon, be called QRA. That is the term quick reaction alert.

About [deleted] of those are ours and [deleted] of those are allies'. That includes Germany, the Netherlands, Belgium and Italy, four countries that do not have nuclear weapons of their own.

Included in the [deleted] are British aircraft which would be sitting on alert somewhere today under their own control, but very much part of General Rogers' plans. Nor did I include some French aircraft that would be sitting on alert for whatever plans the French have for them, but not integrated with General Rogers' forces.

The major modernization effort, of course, that the Air Force is looking at for TNF is the ground-launched cruise missile, the GLCM, a model of which we have here. It is the variant of the Navy's SLCM, the sea-launched cruise missile, and borrows much from it.

That program, for instance, is managed in the Joint Cruise Missile

Projects Office and the program manager is here, and you can talk about it with him today.

Really, the only difference, other than the different launch configuration that this missile has, is that it has a different warhead suitable for Europe. It has a W-84. The W-80 is going in the ALCM and SLCM.

[Deleted.]

Senator WARNER. Describe the operational characteristics of this weapon now in varying ranges, the altitudes and so forth?

General BURKE. It really is a marvel of American ingenuity, this whole family of cruise missiles sort of illustrates what we can do best when we apply technology to military systems.

It is only about 20 feet long. The diameter is 21 inches, and yet we are satisfied that it can fly 2,500 kilometers at treetop level, 200 feet—

Senator WARNER. 2,500 kilometers is the maximum at treetop level?

General BURKE. 200 feet and navigate with pinpoint accuracy so that it would hit a target within, say, [deleted] after completing that mission, carrying a nuclear warhead with a yield of [deleted].

I would submit that is a marvelous technological achievement.

Senator WARNER. This truck with a picture of it, does that carry four rounds?

General BURKE. Yes, sir. Each truck carries four of these weapons. An operating unit is called a flight. It is made up of four trucks and two launch control centers.

The idea is that these will be based in Europe; there we are looking at England, Italy, Germany, Belgium and the Netherlands. The normal condition of peacetime would be, as General Rogers said, they would be stored in hardened shelters, which we hope would protect them against an unanticipated conventional attack, but certainly not against a nuclear attack.

Then in times of tension and increased alert, we have the capability to take them in those vehicles such that we have pictured there and disperse them in the countryside and thereby insure their survivability.

MISSILE PRODUCTION

Senator WARNER. Just take me through it basically, I want the record to reflect where the program is.

General BURKE. We will be beginning production in 1981 with a requested buy of 11 missiles. There is a further request in Carter's 1982 budget to provide 54 more missiles.

In 1983, the plan is to go to [deleted] missiles and that would be the production rate for a few more years.

We hope to begin fielding our first [deleted] in England in December of 1983; [deleted] thereafter the second in Italy; and almost immediately after that, one in [deleted].

I think we are on track with that first one and I expect we are going to make that. We are going to try very hard to make those others, but they are going to require some very strong efforts because we are not nearly as far along in identifying exactly where we are going to locate them and working out the necessary construction.

Additionally, I would like to call to your attention that there is

an increase in the estimated cost of this system. The \$400 million contained in the 1982 budget submitted by former President Carter would not be sufficient to maintain the planned operational capability dates.

So, again, in President Reagan's review of the 1981 supplemental and the 1982 amendment, the GLCM program is under consideration and I would suspect that there would be some additional requests coming over.

Mr. Chairman, that fairly well covers the Air Force's involvement in TNF. I think we have a good and a logical combination there.

DUAL-CAPABLE AIRPLANE

The dual-capable airplane is really the most cost-effective way to add force, because the force is still available and still planned for all manner of other missions; they are very flexible. You can put them against any target anywhere.

I think the GLCM will make a very nice complement to that, particularly in the fact that it is very long range, it has very high en route survivability and it is accurate.

Senator WARNER. General Burke, tell me a little bit about the command and control structure of the GLCM? What did you call this integral unit, a flight?

General BURKE. A flight is made up of four of those transporter-erector launchers, each of which has four missiles.

Senator WARNER. That unit is then placed at what level in the ground forces?

General BURKE. Those would be assigned to Air Force units, wings, in those countries.

Senator WARNER. I am trying to get in my mind how they get out in the field, how do they integrate with the ground forces, the Army?

General BURKE. They would go out into the field on direction and authorization of General Rogers, who would have that consultation process he talked about.

Senator WARNER. All right. Take the chain down to the fellow who drives the truck. How does that chain go down? Does he talk to a brigade commander somewhere?

General BURKE. No, sir. He is subordinate to SACEUR through his Air Force component commander.

Senator WARNER. Right straight down through that chain?

General BURKE. Yes, sir.

Senator WARNER. So the targets are called in through an Air Force chain?

General BURKE. Well, starting with General Rogers.

Senator WARNER. I understand that, but below him it gets into the blue suit and that is it, right straight down?

General BURKE. Very quickly, yes, sir.

Senator WARNER. That is very interesting.

Is it your understanding that when the GLCM's come on line, additional quick reaction alert aircraft will be available for early war-time conventional missions?

General BURKE. Yes, sir, I think that again that would depend in no small measure on how General Rogers best intends to use them,

but that is certainly one of the prospects. One of the attractive prospects is that the F-111's could be taken off alert and assigned to other theater missions.

Senator WARNER. All right.

Thank you very much, General Burke.

General BURKE. If I might add a sentence on chemical warfare?

Senator WARNER. Go ahead.

CW AND PROTECTIVE EQUIPMENT

General BURKE. The Air Force is not as involved in that as the Army. I must say that we worry about it a great deal and you will see in our budget submission a fair sum of money identified for chemical warfare, but it is all identified with protective equipment and clothing and I think that we may even delude ourselves into thinking that that solves the problem, that is if we invent the finest protective equipment.

We are spending money in conducting research to improve our defensive posture but I do not think there is any prospect whatsoever that that solves the problem. I am struck by the fact that in warfare there is probably no area in which the offense is more favored than the defense as it is in chemical warfare.

We would have an air base in Europe as it is now configured probably costing the taxpayer about \$3 billion in investment.

Senator WARNER. In investment. That is aircraft, ordnance and everything else, and no value put on human life?

General BURKE. Yes, sir.

[Deleted.]

Even if we go through very strenuous efforts to equip and train our people to use the defensive capability, we are never going to get back 100 percent. It is just enormously difficult to maintain, fly and arm airplanes when you are wearing all that protective equipment.

So I just feel that we have got to have an offensive capability. We have got to deter it.

Senator WARNER. How many bases would be vulnerable?

General BURKE. Certainly all of the bases on the Continent would be vulnerable, and you could not rule out attacks on the bases in the United Kingdom, either.

Senator WARNER. About how many would that be?

General BURKE. We have on the order of—I will supply the precise number for the record—about 11 main bases on which we have large numbers of aircraft.

[The information follows]

NUMBER OF BASES

There are seven main operating bases in the United Kingdom; RAF Alconbury, RAF Bentwaters, RAF Lakenheath, RAF Mildenhall, RAF Upper Heyford, RAF Woodbridge, and RAF Fairford. Although RAF Fairford does not have aircraft permanently assigned like the other six bases, it is considered a main base because of the permanent presence of rotational aircraft.

On the continent, there are eleven main operating bases. They are Bitburg AB, Federal Republic of Germany (FRG); Camp New Amsterdam, Netherlands; Hahn AB, FRG; Hellenikon AB, Greece; Ramstein AB, FRG; Rhein Main AB, FRG; Sembach AB, FRG; Spandahlem AB, FRG; Torrejon AB, Spain; Zaragoza AB, Spain; and Zweibrücken AB, FRG.

Senator WARNER. And then in England what, three?

General BURKE. No, sir. We have got about seven.

Senator WARNER. Seven, and some of those are shared facilities?

General BURKE. Yes, sir.

Senator WARNER. That is very impressive. Thank you very much. Admiral, I welcome you.

Now, I am on more firm ground. We will not have to go through, perhaps, the first grade, and I appreciate the patience of everybody going through first and second grade.

ABILITY TO SURVIVE

Admiral CARTER. I will not have to familiarize you with weapons systems again, but I do wish that in my first appearance before your subcommittee, I could give you a more cheerful report. The Navy's ability to survive, fight and prevail in a nuclear conflict is continuing to degrade since the days you expressed your concern. I think it is probably at its lower ebb right now than it has been since the early 1950's.

Senator WARNER. We really have not gone into any new programs, have we?

Admiral CARTER. We have not fielded a new nuclear weapon in 16 years. We have had some strong programs for modernization in the past.

Senator WARNER. Did we not add a few Subroc's to the inventory?

Admiral CARTER. That is not a new weapon.

Senator WARNER. But the numbers. Did we not buy a few more somewhere along the line?

Admiral CARTER. Yes, sir; after having produced [deleted] Subroc's from 1964-68, we reopened the production line in 1972 and produced [deleted] units from 1972-74.

But anyway, of course this has happened to us in the period when the Soviets are increasing the number of systems they have deployed on maritime units dramatically. They have over [deleted] individual systems devoted to maritime systems.

We are now down to [deleted] if we do not do something very soon, we will not have anything left by the 1990's except [deleted] because of the aging problems.

I will not tell you how we got into that situation and take up your time. I think you know.

I want to spend a few moments telling you how we would get out of it, we hope.

AAW MISSILES

In the AAW area where we are most concerned about the vulnerability of the battle groups against the high-performance Soviet cruise missiles, such as the AS-4, we feel that we need to field a new AAW missile probably initially at least using the airframe for the standard missile two, and that will give us the capability to reach out and kill the nuclear warhead on the incoming missile in time to defend battle groups.

[Deleted.]

This has been studied repeatedly. We had a considerable program

in the SM-2 as you recall in the late 1970's, but in 1978, the Secretary of Defense precluded the Navy from spending any more money on nuclear modernization pending the outcome of an OSD study of the Navy's needs for nuclear weapons.

That study was completed and signed on January 2, 1981.

We are now just starting these programs, and we hope to make some real progress this coming year.

In the ASW field Subroc and Asroc are both very old [deleted].

We are working on a new stand-off weapon that would have a [deleted] and for the purposes of efficiency and trying to save the taxpayers money, we hope to build [deleted].

SHIP-LAUNCHED CRUISE MISSILE

In the land attack area, we hope to move forward with a ship launched cruise missile. I am not going to get into that today because we have some time with you a week from today in which we will cover that in much greater detail.

I know, of course, that new weapons systems are not a panacea for correcting what is wrong with the Navy's war fighting capability in the nuclear area. We are working hard on improving ship survivability. We have revamped the training command in order to teach our people to think nuclear. We are extending to where all of our war exercises are into a nuclear phase.

Senator WARNER. I am glad to hear that.

Admiral CARTER. I hope by 1 year from now when I come back to see you again that we will have some real progress to report.

That is all I have.

Senator WARNER. Did you cover the chemical?

Admiral CARTER. The Navy's chemical area? Yes, sir. [Deleted.]

Senator WARNER. That is it?

Admiral CARTER. That is it.

Senator WARNER. Do we carry any chemical in the carrier inventory?

Admiral CARTER. [Deleted.] That is handled mostly by the Marine Corps.

Senator WARNER. I beg your pardon?

Admiral CARTER. That is created mostly by the Marine Corps requirements, but our present inventory we consider totally inadequate.

We also have very great problems, as everyone else does, in the area of adequate, protective clothing and training for our people in chemical warfare. We are working that problem very hard.

Senator WARNER. Refresh my recollection with respect to the carrying of chemical warfare ordnance on ships. We terminated it at one time. What were those years?

Admiral CARTER. I will have to take that and get it for the record. It has been a long time ago.

[The information follows:]

Available records do not indicate that the U.S. Navy has ever carried chemical weapons in our ships for operational employment. [Deleted.]

Senator WARNER. Does anybody have any corporate memory on this?

All right.

Now, we will go on with questions, gentlemen. We will try to move along but I am very, very grateful for your patience. This has been an important hearing and will lay the foundation for a new area.

I say new in the sense that it will put a new impetus on the Senate side to get going.

REVIEWING REQUIREMENTS IN TNW

Now, Dr. Wade, do you anticipate hard choices having to be made in the near future between allocating special nuclear material to strategic rather than theater nuclear weapons?

Dr. WADE. Mr. Chairman, I think we have been very successful over the last year in reviewing our requirements for the Congress, noting the major shortfalls, particularly in the [deleted].

We have turned [deleted]. We are adding to our force structure.

Where there is a possible shortfall, we foresee in the [deleted] I believe—

Senator WARNER. [Deleted?]

Dr. WADE. [Deleted.]

We are looking at that problem.

One approach we can take here is to make sure that we do not overstress the priority toward [deleted]. If you will note the comment I made earlier that we have to deter the total spectrum of conflict, and if you start [deleted].

We have to be careful with the comments that I hear so often. There have to be [deleted]; and, if need be, we will have to better share in the sense of looking forward toward [deleted]. We might have to [deleted].

As far as future planning requirements are concerned, I think it is terribly important to recognize the lead times that are required to [deleted] to give us the needed time to [deleted].

Senator WARNER. Now, that question in its broader context would indicate, and your answer thereto, that so far as America's availability of nuclear materials, your first crunch, then, is [deleted].

Dr. WADE. That is the time we start getting into real trouble, yes, sir.

Senator WARNER. Why is it, with the leadtime we have between [deleted] that we cannot begin to prepare to meet that?

Dr. WADE. Well, Mr. Chairman, as I said, we are planning to [deleted]. We are also getting ready to [deleted].

When I state that estimate as to a downstream shortfall, that is taking into account [deleted].

Now, if you ask what about turning on new facilities, the leadtime is about [deleted]. That is a problem.

Senator WARNER. I understand that, and I appreciate it.

Dr. WADE. But I would also note that we have in our stockpile on the order of [deleted] weapons and that is a sizable number of weapons. I think, with better planning, we ought to be able to readjust that number so that the force allocation across the Army, Navy, and the Air Force is such as to be in a credible posture.

BUDGETARY SUPPORT

Senator WARNER. What plans exist, Dr. Wade, and what budgetary support is planned for enhancing our theater nuclear deterrent in [deleted].

Dr. WADE. DOD is reviewing the theater requirements across the board. [Deleted.]

We have not gotten very far along in the review, but we always have in the interim [deleted.]

So I personally do not think we are that bad off as far as our current posture in [deleted] is, Mr. Chairman.

General BURKE. I think the Pacific Command is even now addressing the question and they would like to ask for some of these [deleted] to be stationed in that part of the world.

General FULWYLER. As a matter of fact, there is a PACOM TNF study underway right now with the first phase due to be completed this summer which addresses this very thing, what should the TNF requirements be for PACOM.

Senator WARNER. Dr. Wade, is it my understanding that the assistant to the Secretary of Defense has been identified as the principal OSD individual responsible for CW matters?

Dr. WADE. Mr. Chairman, last December that recommendation was made to Secretary Brown. He approved this approach on an interim basis; and, there is a paper now in the hands of the new SECDEF which addresses where the OSD focal point on CW matters should be.

My recommendation was toward the Office of AE. But that decision has not yet been made.

Senator WARNER. Well, hopefully with your continuity—it does not make any difference where it is, in the long shot, as long as I can find you, because you have got the interest and the knowledge.

Dr. WADE. Yes, sir. It should be placed in a senior position within OSD. That has been a major failing to date.

Senator WARNER. We have covered slightly the next question, but let's have it accurately in the record.

ADMINISTRATION'S STANDS ON FUNDING

Where does the present administration stand on funding the \$19 million needed to equip the binary production facility at Pine Bluff?

It is under review?

Dr. WADE. It is under review right now, yes, sir.

Senator WARNER. In terms of the supplement?

Dr. WADE. I would expect a decision to be made in the next couple of days.

Senator WARNER. Fine.

Will funds for this purpose be in the 1981 budget; and the answer is yes?

Dr. WADE. Yes, sir. I expect this to be the case.

Senator WARNER. I would note that both Secretary Weinberger and Deputy Secretary Carlucci in testimony before this committee have voiced a strong support for getting on with this program.

Dr. WADE. That is why I am giving you a positive signal now, sir.
 Senator WARNER. Nothing has changed since I left.

CW INTELLIGENCE OPERATIONS

Dr. Wade, will you comment not in detail for the record on the importance you personally attach to CW intelligence operations, the confidence you feel in the intelligence estimates being produced at the current level of effort, and ways in which additional resources could usefully be spent to improve the product by expanding CW intelligence efforts.

Dr. WADE. Mr. Chairman, as of last summer, I would note that our intelligence capability in this area was [deleted]. As a result of the major review by the Defense Science Board, and its recommendations that followed their study, there has been a letter sent to the Director of CIA [deleted] in this area.

Senator WARNER. And that letter is dated October 3, 1980?

Dr. WADE. Yes, sir.

Senator WARNER. At this point, we are going to insert in the record our copies of that correspondence.

[The correspondence is classified and retained in files of the committee.]

Senator WARNER. I had just addressed that correspondence, which we just got copies of.

Dr. WADE. Our purpose has been to get [deleted] our intelligence. It is a tough problem; nevertheless, at least we are [deleted] getting a handle on it.

Senator WARNER. In our hearings with Director Casey, we brought this up and he reaffirmed the need to do it, so I think we are all right.

Dr. WADE. That is not only within the CIA, but there is [deleted] within the DIA.

Senator WARNER. Dr. Wade, what plans now exist to demilitarize obsolete chemical agents now in the arsenal?

Dr. WADE. I will ask General Fulwyler to address that one, sir.

General FULWYLER. Yes, sir.

Of course, this, in my opinion, constitutes not only one of the Army's major problems, but a national problem as well. As you know—or you probably do not know—we have over [deleted] munitions that we need to demolish. We also have about [deleted] containers of leaking munitions that we have to demolish.

What makes this problem difficult, is that we are pushing the state of technology to the very limit to achieve a capability which would enable us to do this both economically and in the quantity which will enable us to get the task finished.

CAMDS

Right now, we have what we call a CAMDS—a chemical agent munition destruction system—which is a pilot program out in Tooele Army Depot in Utah.

This \$67 million facility went into operation a little over 1 year ago and is being used as a pilot project to point the way toward

technology and procedures to enable us to attack this overall problem.

Right today, included in both 1981 and 1982, we have moneys there to start doing research and development, or additional research and development I should say.

Right now we have, as you probably know, a number of munitions stored out on Johnston Island Atoll in the Pacific. These were munitions that were originally to be brought from Okinawa to the continental United States.

Public law prevented us from moving those munitions into the country here. Beginning in fiscal year 1982, we have programed funds to design a facility on Johnston Atoll for demil.

We would envision at this point construction of some type of facility out there, probably in the 1984-1988 time frame.

DEMILLING—A NATIONAL PROBLEM

OSD has also envisioned establishment of some regional demil plants within the United States. We do have money in both 1981 and 1982, and on out, for attacking this problem but there is one point that I would like to again underline.

The demil is not an Army problem; it is a national problem. Regardless of what happens to the binary or anything else, all of the current chemical munitions that we have at some point in time are going to be required to be demilled and we have a problem right now that is growing every day. It will continue to do that, same as we have on the nuclear waste problem.

So I say it is a national problem. The total demil program is probably going to cost somewhere in the vicinity of \$3.7 billion and the Army cannot shoulder that cost alone.

We are making progress in this area but, again, I cannot predict to you when we will be able to indeed have the problem solved.

We are attacking it now by putting more moneys in the R. & D. area, which I think is essential to find the way to do it.

Senator WARNER. \$3.7 billion over what period of time?

General FULWYLER. Well, sir, that depends on when we start. I am talking about doing the total destruction of the stockpile.

Senator WARNER. Well, there is a lifespan on this material, and I suppose if we do not act on it within that lifespan, then we run the risk wherever it is stored. We run some severe risks.

Am I correct?

General FULWYLER. Sir, that is the problem we face today. The figure it would take to get rid of everything that we now have, if we could do it now, would be \$1 billion.

Certainly if we think in terms of the time that is going to be required to do this, then I must tell you I would estimate, at the earliest, we could start meaningful demil of our current stockpile in 8 to 10 years from now.

Senator WARNER. That is the late 1980's?

General FULWYLER. That is the earliest I feel you will have a new military facility to start demil.

Senator WARNER. Whether it is here or out at Johnston Island.

General FULWYLER. The problem is the state-of-the-art, technology.

MAINTAINING SAFETY

Senator WARNER. That is a pretty striking revelation.

Can the existing stockpiles be maintained safely for that period of time, in your professional judgment?

General FULWYLER. Sir, that is the problem we have today. Our stockpile is deteriorating more every day.

Senator WARNER. More rapidly than we are able to [deleted].

General FULWYLER. Yes, sir. Unserviceable/repairable munitions constitute [deleted] of the current stockpile. Of the [deleted] agent tons in the munitions stockpile, [deleted] agent tons are in unserviceable munitions which can be brought to serviceable condition by various maintenance operations. This, however, takes time. Of the some [deleted] agent tons in serviceable munitions, only about [deleted] agent tons are in munitions which are in a ready for issue condition.

The current maintenance—

Senator WARNER. I guess I have to clear up a couple of technical problems.

When you say "agent"—you see, one of the reasons we are going through this record in such a basic manner is that hopefully it will provide a source of research and study for my colleagues, some of whom are quite new to this area.

So while I may have a little knowledge over and above the questions indicated, I want this record here for others to look at, particularly my colleagues in the Senate who are not on the Armed Services Committee.

So let's go back. What do you mean by this?

General FULWYLER. When I am talking about agent, I am talking about the chemical fill of the munition. For instance we have primarily GB or VX and some World War II mustard agent, which is also in the stockpile.

So when I talk about agent I am talking about—

Senator WARNER. The weapon itself?

General FULWYLER. No, the chemical itself which is inside the weapon and as you know, all of our munitions are what we refer to as unitary munitions. That means the actual agent itself, the chemical agent, is located within that munition.

That is different from the binary, which will feature two relatively harmless chemical components which only become lethal and toxic when they are mixed together in flight.

STORING CW MUNITIONS

Senator WARNER. I understand that, but I am addressing the present inventory of CW munitions. The specific questions is can we as a Nation continue to store these in a manner safe to our own citizens, military and civilian, in the general location of the storage until such time that the system is put in place to destroy?

You indicate that that system is probably not feasible until the late 1980's.

The question, again, is of safety.

General FULWYLER. Yes, sir.

We do have facilities and we have improved our facilities for the safe storage of these munitions. As far as within the continental United States, the areas where we store our munitions are safe and certified—they have never had a serious accident there. The only facility which I would have to admit is not totally safe, in my judgment, is where we currently have the munitions stored on Johnston Island. However, we have design moneys approved now, and we plan to commence construction there within a couple of years of some 19 additional igloos where we will take those munitions and put them in a safe and secure storage.

ABILITY TO MAINTAIN SAFETY

As far as the storage facilities in the United States, I would say yes, we have the capability to maintain them for an indefinite period of time in a safe and secure environment, preventing them from being hazards to the public. But the problem is that our stockpile itself, those usable by this country, is deteriorating. In case we had to go to an alert situation or even combat itself, [deleted].

Senator WARNER. General Burke, I understand there have been some technical difficulties in the GLCM program related to software of the transportation launcher. What is the problem and what will it cause in terms of slippage to the IOC?

General BURKE. If I might, sir, I would like to defer that question to Adm. Walt Locke, who is program manager for the Joint Projects Office.

Senator WARNER. All right.

COMBINED GROUND LAUNCH AND SEA LAUNCH

Admiral LOCKE. The software job turned out to be larger than we envisioned in the first place. It is a combined program with ground launch and sea launch program.

The contractor responsible for that dropped behind. We slipped the schedule 6 months as far as his delivery of software and therefore the start of test evaluation associated with software.

We were able to maintain the IOC, however.

What we have done is increase the risk of achieving that IOC, but at this time I believe we could still make it in December of 1983.

Senator WARNER. Are both systems sea and ground?

Admiral LOCKE. The sea is for the summer of 1983.

Senator WARNER. It is a common software?

Admiral LOCKE. It is mostly common. The sea is more complicated by having an antiship and the ground launch is more complicated by having a more complex permissive action link.

The ground system is, as a whole, a larger undertaking. That is because the communications have to be provided. The communications are already aboard ship and the ground system, the launch control center not only has a fire control system but has extensive communications related to the release of the nuclear weapons.

COMPARING PERSHING AND GLCM

Senator WARNER. I have one more question. I am just interested in the comparison between the operational performance of the advanced Pershing and the GLCM.

What are the relative advantages of the GLCM over the advanced Pershing?

Dr. WADE. Well, the Pershing system is a ballistic missile system. The cruise missile system is a flying machine.

Senator WARNER. That is the main thing, the trajectory?

Dr. WADE. One, the PII can get there much faster.

Senator WARNER. And it is less detectable?

Dr. WADE. Well, in general terms, yes. It depends on what kind of defensive system you have to face.

The PII travels, in general terms, supersonic, while the cruise missile's velocity is less than Mach 1.

The defensive characteristics that are needed to defend against these systems have to be different.

Senator WARNER. You complicate his problem.

Dr. WADE. You complicate his problem.

Senator WARNER. And how far along are the Soviets in the cruise missile technology?

Dr. WADE. They are many years behind us in comparable technology.

Senator WARNER. Why is that? Again, I do not profess a great expertise but the airframe is relatively simple, the powerplant must be relatively simple, the guidance system. Why is this?

General BURKE. The Soviets have made cruise missiles for many years. We have cruise missiles going all the way back to at least the V-1. In fact, Mr. Kettering developed a cruise missile all the way back in World War I.

MICROELECTRONICS

What has changed dramatically is microelectronics. It has let us develop very small and hence, cost-effective systems, the ability to navigate great distances with high accuracy.

Senator WARNER. I missed a few words. Enables us to navigate a great distance with what?

General BURKE. Great accuracy.

Senator WARNER. Great accuracy?

General BURKE. Yes, sir.

The early cruise missiles that we had in this country 15 to 20 years ago, were quite inaccurate and they were also quite big and they tended to cost a lot of money. This current generation, while not cheap, is, in a relative sense, quite a good bargain and a highly capable system.

Microelectronics is probably the area where we have the greatest technological lead over the Soviet Union. Another area that we are well ahead of them is the ability to build a very small jet engine. You can pick up the engine that propels the cruise missile.

Senator WARNER. Is that right? One man?

General BURKE. Yes, sir. You will not carry it in one hand, but you can pick it up.

Senator WARNER. I said one man, one good man.

General BURKE. Yes, sir. It is something that you or I could pick up and that was developed by a very small businessman in Wisconsin, Sam Williams, an authentic American genius. We know that the Russians have made serious efforts to get hold of engines of that type.

They lag quite a bit behind us.

They are building cruise missiles. We have just seen the new cruise missile submarine, for instance, and we have a lot of interest in it. They have the cruise missile for their Backfire, but it is a very large one, compared to this it is a primitive device.

Senator WARNER. So it is basically in the engine technology and the miniaturization of the electronics?

General BURKE. Yes, sir.

Senator WARNER. Where do we stand on the question of [deleted] and is that desirable as a counter to the SS-20?

Mr. WADE. The idea of a [deleted] Mr. Chairman, came out of a summer study conducted by the Defense Science Board about 2 years ago. I must say at this time that I am not attracted to the idea. One reason is we have to get this weapons system in country [deleted]. A change at this time would cause delay.

Second, [deleted].

General FULWYLER. May I add something, Mr. Chairman?

Senator WARNER. Yes.

General FULWYLER. I agree, essentially, with what Dr. Wade has said, but let me emphasize one point. [Deleted.]

Senator WARNER. General Burke, can you technically [deleted].

General BURKE. It has been thought about. It does not appear to be a practical system.

Senator WARNER. Because it would self-destruct?

Dr. WADE. The warhead for the new cruise missile [deleted]. Basically it is not feasible.

Now, if you can shorten the range, you have a better option, because you can then increase the available payload.

Senator WARNER. The record will be open until 5 p.m. for the purposes of questions by any of the members. I want to thank each of you again. I think we have laid a good record here, and one that will be usable by other members, particularly those who go to the floor and handle these tough questions.

I thank you for your patience and your endurance.

Dr. WADE. Thank you.

General BURKE. Thank you, Senator, it was a pleasure.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER, ANSWERS SUPPLIED BY GENERAL ROGERS, GENERAL FULWYLER, AND DR. WADE

THEATRE NUCLEAR FORCE

Senator WARNER. General Rogers, what is your assessment of the current state of our TNF safety, security and survivability? Are adequate resources being made available to ensure the security of weapons under Programs of Cooperation and U.S. nuclear devices in Europe?

GENERAL ROGERS. Measures to improve the safety, security and survivability of the theater nuclear forces are a matter of high priority. There are improvements [deleted]. Survivability of TNF is inherent in the survivability of the theater itself. Factors vital to this include:

(a) Command, control, and communications (C3) that are secure, survivable, and reliable.

(b) Optimum posture (positioning, readiness and balance) of the TNF.

(c) [Deleted.]

(d) Security during peacetime, deployment phase and wartime. We are dealing with and solving the conflicting, sometimes contradictory, objectives of peacetime security versus wartime survivability. Maximum dispersal of our nuclear stocks increases survivability, however, [deleted]. We are striving to strike this balance in all of our improvement programs and while near-term progress is being made, further long-term actions are needed to [deleted]. Efforts such as the TNF Command, Control and Communications System Improvement Program and the Long Range Security Program are directed at improving the [deleted] supporting the theater nuclear force. We also have a very extensive research and development program underway which is addressing technological aspects related to security and survivability of theater nuclear weapons. We are in full agreement with our NATO Allies on the objectives of these programs, and notable progress is being made in all Program of Cooperation nations toward reaching [deleted]. Resources adequate to support these programs are being provided from both U.S. sources and NATO infrastructure funding.

TNF SURVIVABILITY

Senator WARNER. General Rogers, what steps are currently programmed—and what additional steps are necessary—to enhance the survivability of those weapons?

General ROGERS. I am concerned with the survivability of our nuclear weapons. In recent years, we have emphasized the peacetime physical security of nuclear weapons, but, in many instances, the requirements for peacetime security and wartime survivability are conflicting. Peacetime security requires consolidation and elaborate security lighting and fencing while wartime survivability requires dispersal and low visibility. Even so, we must have both peacetime security and wartime survivability.

In the transition to war, one of our early actions is [deleted].

Current plans are for the [deleted].

Another concern is the [deleted].

For the longer term, we are supporting a Defense Nuclear Agency R&D program to improve the theater nuclear force survivability, security, and safety (TNFS3). USEUCOM is a member of the TNFS3 Steering Group, and has stressed that the current DNA program should emphasize, as a first priority, systems to improve the battlefield survivability of our theater nuclear force. As a second priority, we have recommended that DNA concentrate on a program to enhance our transition from peace to war. In addition, we have an [deleted]. We believe the DNA TNFS3 Research and Development Program will [deleted].

In summary, we recognize that our TNF weapons systems and their supporting C3 [deleted]. Additionally, we continually review our operation procedures to identify additional measures we can implement to improve TNF operational security.

Senator WARNER. General Rogers, do you see our TNF logistics operations as being particularly inviting and susceptible targets for Soviet chemical warfare attacks?

General ROGERS. First, it is important to understand something of the theater nuclear weapons logistics systems. As we transition to war, the ground delivered weapons, once deployed, do not require extensive logistics support, and a nuclear weapon logistics system analogous to the conventional ammunition system is not necessary.

There is an Army and Air Force distribution system which moves the weapons from the [deleted]. These activities could be attacked by chemical weapons. U.S. personnel have the necessary chemical protective devices, [deleted].

In summary, I do not believe our nuclear weapons logistics systems are any more inviting or susceptible targets for Soviet chemical attacks than other elements of our combat power.

NATO INFRASTRUCTURE FUNDING OF THE TNF SURVIVABILITY UPGRADE PROGRAM

Senator WARNER. How are we going to resolve the NATO infrastructure funding problem as it relates to the TNF survivability upgrade program?

Dr. WADE. It is recognized that there are competing high priority pressures for use of NATO infrastructure funds. Traditionally, those funds have been

designated for support of programs that have significant impact on the overall military effectiveness of NATO's forces. The TNFS³ program has identified a limited number of high priority improvements to NATO's theater nuclear forces which, if proven in principle and adopted, can significantly enhance the overall effectiveness of NATO's theater nuclear forces. Thus, it is anticipated that this program will have long-range impact on NATO infrastructural funding. Most of these programs require 1-3 years of research and development before they will be ready for potential adoption by NATO and potentially scheduled for infrastructural funding. Because of this required R&D time, there is time for an orderly addressal with NATO of the availability of infrastructural funds to permit deployment of those improvements which most significantly impact on the effectiveness on NATO's theater nuclear forces. Early coordination of the overall program with NATO will permit a timely resolution of the problem of allocation of limited resources.

U.S. FUNDING OF THE TNF SURVIVABILITY UPGRADE PROGRAM

Senator WARNER. In the absence of such a resolution, do you intend to pursue unilateral U.S. funding of these necessary enhancements?

Dr. WADE. In the event NATO infrastructural funds are not available when needed, unilateral U.S. funding of high priority enhancements will allow for significant improvement in the effectiveness of a major part of NATO's theater nuclear forces. Thus, it seems prudent to pursue U.S. unilateral funding.

Senator WARNER. Dr. Wade, what additional funding is required in fiscal year 1981 and fiscal year 1982 to accelerate improvement of our chemical defensive posture?

Dr. WADE. The Army has requested an additional \$47M in fiscal year 1981 and \$161M in fiscal year 1982 to improve readiness for chemical warfare. The resources requested provide additional chemical defensive equipment, an expanded RDTE technology base effort, and a capability to produce the 155mm binary chemical round. These resources will permit acceleration of our chemical defensive posture improvements through fiscal year 1982 and provide funds to equip the binary facility previously authorized by the Congress. Authorization of the funds for the binary facility will allow the initial step in eliminating the most serious deficiency remaining, the absence of a credible chemical retaliatory capability, which, in deterring the first use of chemicals, becomes a major element of defense against them.

Senator WARNER. Dr. Wade, is incorporation of collective chemical defense systems into weapons systems now being procured of increased importance in the light of evidence of use chemical agents in Afghanistan, Laos and Cambodia?

Dr. WADE. Yes, it certainly is. Over the past decade, the Army has been installing collective protective systems on key combat tracked vehicles (tanks, carriers and recovery vehicles). These filter systems, used in conjunction with protective masks, do not allow crew freedom of movement and interface with weapons systems essential to the employment of the vehicle or its armament. Essentially, the development of collective protection systems has not kept pace with the evolving doctrine and tactics of how the Army should fight in an NBC environment. Although the importance of collective protection has been reinforced by the reports of chemical agent use in Afghanistan, Laos and Cambodia, the Army has not been able to field a system or systems to meet the diversified requirements of the many systems currently in use or in development. The Hybrid Collective Protective Equipment (HCPE) is the current answer to solve the diversity of need problem. Consisting of both positive pressure and ventilated facepiece protective systems, the HCPE offers the greatest operational flexibility. HCPE will maximize protection, minimize vulnerability and allow diversified application due to modular design. Type classification is scheduled for Feb 1983. This system will be applied by a product improvement to the M1 tank and will be configured for use on the family of fighting vehicles. Until these applications are made, the Army is solely reliant on the ventilated facepiece or individual protective mask for vehicle collective protection.

CHEMICAL WEAPONS TRAINING

Senator WARNER. General Rogers, in what ways can chemical weapons training be improved? What are the associated costs of such improvements and to what degree are they budgeted?

General ROGERS. In the last several years, we have made significant progress in the chemical defensive training of US and Allied forces. The necessary defensive equipment is generally on hand in sufficient quantities for training. Our chemical defense exercises are becoming more numerous and more realistic. All the Allies [deleted] are supporting efforts in chemical defense capabilities. One major problem is the lack of realistic chemical simulants which are ecologically safe, yet will cause our detection and alarm equipment to react. The Department of the Army has a research and development program to develop such a training simulant. [Deleted.] We are working to resolve these problems.

The situation is totally different concerning chemical retaliatory operations training. [Deleted.] A major problem in [deleted] is the political concern of some of our Allies. [Deleted.] We are attempting to resolve this issue within NATO.

On a more basic level, very few of our personnel are trained in chemical employment. For a long time, we, the United States, deemphasized chemical warfare. During that period we lost most of our CW expertise. We are just now rebuilding our capabilities. The Army has recently reestablished a chemical school and is taking steps to resolve these problems.

Senator WARNER. Dr. Wade and General Fulwyler, in what ways can chemical weapons training be improved? What are the associated costs of such improvements and to what degree are they budgeted?

Dr. WADE/General FULWYLER. Our philosophy is integrated training. That means that the soldier is trained to perform his military skill in a simulated CW environment. The objectives are to achieve automatic and exact reaction to attack and to minimize the degradation that occurs under full encapsulation in protective gear. There are associated physiological and psychological degradation factors which can be overcome in part by training under simulated conditions.

Effective training for the realities of CW affords the greatest readiness payoff in the short term. Command emphasis from the Army leadership down to junior leaders is the essential catalyst. Over the past year, we have consistently and routinely applied that emphasis for both combat and support units.

Unlike the Soviets, our forces do not train with live toxic agents even in dilute concentrations. We have an active R&D effort to develop realistic simulant agents and delivery means which are moderately punitive and interact with detection means and decontamination equipment analogously to the live threat agents. The 1982 budget request for R&D includes \$843K in training systems for chemical defense.

One major shortfall is the lack of a toxic training facility for training our chemical specialists with live agents. We are now looking at the construction of such a facility, consistent with environmental standards, at Fort McClellan, AL, which is the location of the Army Chemical School. The estimated cost for the facility is \$4.7M (MCA) and \$190K annual operating cost (OMA).

The Army's 1982 budget request seeks to continue programs for stockfunded chemical defense equipment for both Active and Reserve Component forces. This program is essential for hands-on performance experience with individual protective items, in order that the soldier knows how to react automatically and correctly to chemical attack. The fiscal year 1982 budget request includes \$34.4M for Active Component and \$11.3M for the Reserve Component for training and contingency issues of chemical defense equipment.

For too long, the Army has oriented training on its conventional warfare experience. The thrust of our program is to change the way in which the Army perceives the battlefield environment, and thereby institutionalize the kind of training emphasis and readiness that will prevent us from losing because our adversary uses chemicals.

CHEMICAL ARMS CONTROL AGREEMENT

Senator WARNER. General Rogers, how would you characterize progress to date on a chemical weapons control agreement with the Soviet Union?

General ROGERS. In considering that these negotiations have proceeded through 12 rounds since starting in 1976, I would characterize their progress as extremely slow. I should add, however, that in any attempt to move beyond the 1925 Geneva Protocols, it is not surprising that such an effort is so time-consuming. Such matters as verification, destruction of existing stocks, and disposition of exist-

ing facilities are highly sensitive areas which do not lend themselves to quick solutions. I believe, however, that one of the reasons for lack of progress in these negotiations is the lack of credibility of the U.S. CW retaliatory capability.

Senator WARNER. Dr. Wade/General Fulwyler, how would you answer that same question?

Dr. WADE/General FULWYLER. The U.S.-U.S.S.R. negotiations on a treaty to ban production, possession, and use of chemical weapons began in July 1977 after three rounds of technical talks. The twelfth round of talks ended in July 1980 and as yet no date has been set for round 13. No significant progress has been made on substantive issues with verification procedures being the most critical. This chart summarizes the major issues and positions.

Issue	United States	U.S.S.R.
Scope of Prohibition.....	[Deleted.]	
Declaration of Stocks.....		
Declaration of production facilities.....		
Verification.....		
Entry-into-force.....		

There is [deleted] for a major change in the Soviet position. The U.S.S.R. [deleted]. The Soviets, [deleted] in this area while the Soviets improve their capability.

In view of the absence of meaningful progress to date in the bilaterals, I believe that a review should be conducted to determine where we want to go in the CW negotiations. If such a review [deleted] of the efforts to achieve a CW treaty, then the review group should devise a [deleted] for attaining our goals.

CHEMICAL WARFARE

Senator WARNER. General Rogers, do you believe that creation of a binary production capability is likely to improve or worsen the prospects for progress toward a CW agreement?

General ROGERS. The creation of a U.S. binary capability could be seen by some as a drawback to these negotiations, but I do not share that view. I believe that production of the binary round could improve our negotiating position since the lack of progress in these negotiations may be due, at least in part, to the lack of credibility regarding our chemical retaliatory capability.

Senator WARNER. Dr. Wade and General Fulwyler, do you believe that construction of a binary production capability is likely to improve or worsen the prospects for progress towards a CW agreement?

Dr. WADE/General FULWYLER. Obviously, the Soviet negotiating position is effected to some extent by their perception of U.S. capabilities. [Deleted.] On the other hand, a strong move by the U.S. to modernize its CW retaliatory capability (such as construction of the binary facility) with the concomitant enhancement of NATO's capability, may well be the necessary ingredient to induce the Soviets to become more flexible in their position. [Deleted.]

Senator WARNER. Do you agree with this statement: "Circumstances may require improvements in the deficient U.S. CW retaliatory capabilities, along with continuing efforts towards chemical weapons arms control?" I would mention that quote comes from the Arms Control and Disarmament Agency's fiscal year 1982 ACIS.

General ROGERS. I would cast that statement in a more direct vein, by stating, circumstances do require improvements in the deficient U.S. CW retaliatory capabilities in conjunction with continuing efforts towards chemical weapons arms controls. I do not see these two parallel efforts conflicting, but rather working in a complementary manner.

Senator WARNER. The Arms Control and Disarmament Agency's fiscal year 1982 ACIS states that "Circumstances may require improvements in the deficient U.S. CW retaliatory capabilities, along with continuing efforts towards chemical weapons arms control." Do you believe that it is essential to our national security to get on with binary production?

Dr. WADE/General FULWYLER. I most certainly do. In my opinion, we must improve our CW deterrent/retaliatory capability and the preferred way to accomplish this is by production of the safer binary munitions. As stated before, we have neither an adequate CW retaliatory stockpile nor the production base with which to produce one. The current stockpile is decreasing through aging and obsolescence and provides neither the proper mix of agents nor munitions to accomplish our objectives. The binary munitions are the most practical means of establishing a realistic deterrent because of their advantages over the present munitions in terms of safety, security, transportability, deployment, and demilitarization.

It is unlikely that a treaty to ban chemical weapons will be achieved in the near term. Progress to date in the U.S.-U.S.S.R. bilaterals has been disappointing with verification being the primary area of contention. Even under the most optimistic scenario, it would not be before the late 1990's that a state's chemical warfare capability would be eliminated. Therefore, our requirement for a CW deterrent/retaliatory capability will exist for the foreseeable future. I firmly believe that production of binary munitions is the best means of meeting this requirement.

At the same time, we should continue efforts to seek a comprehensive and verifiable chemical weapons arms control agreement as reflected in the ACIS. An initiative to modernize our stockpile may in fact enhance our CW negotiations with the Soviets.

CHEMICAL ARMS CONTROL AGREEMENT

Senator WARNER. In short, as we proceed in trying to get a sound chemical arms control agreement, do you believe it is essential to our national security—in your opinion—that we get on with binary production?

General ROGERS. I believe that the Soviet's superiority in chemical warfare capabilities represents one of the most worrisome aspects of our deterrent and war-fighting capability in Europe. Therefore, I am convinced that the best method available to us to improve this dangerous imbalance is to get on with the binary production.

ITALIAN GLCM MILCON

Senator WARNER. What impact do you anticipate the recent earthquakes in Italy will have on the timely implementation of GLCM-associated MILCON there?

Dr. WADE. Although the impact of the earthquake has been to increase the level of construction activity throughout the stricken area, we have been assured that contractor availability and capability does exist in the [deleted].

Senator WARNER. Dr. Wade, are our chemical decontamination, detection and reconnaissance, and collective protection capabilities vastly inferior to theirs?

Dr. WADE. [Deleted.] Even though we have made progress in our NBC defense capability over the past few years, by comparison, in both quantity and quality, our current generation of equipment is not equal to that of the Soviet/Warsaw Pact forces. In addition, they have a large dedicated and highly trained chemical warfare force—[deleted] and all Soviet forces train extensively, to include the use of live agents, for chemical warfare. Hopefully, our force structure, training and research and development initiatives will permit us to start to close this [deleted] gap.

Senator WARNER. Dr. Wade, are the quantities of individual protective gear now in place in Europe adequate to assure at least initial protection for all service personnel now deployed there?

Dr. WADE. There are sufficient quantities of individual protective equipment in Europe to permit Army combat forces to survive an initial attack and operate for a period of [deleted]. To continue operations beyond that time, adequate war reserve stocks of chemical defensive equipment must be procured, and new equipment must be developed to meet the special requirements for rapid decontamination and long term encapsulation in protective equipment. The FY82 budget increases stocks of currently available chemical agent alarms, decontamination equipment and combat vehicle filters to about [deleted] percent of the Army requirement. [Deleted] with the requirement for protective shelters supported at [deleted] percent and vehicle collective protection systems supported at

[deleted] percent. The following chart amplifies the percentage fill expected for our major items of equipment and individual NBC protective items:

	Fiscal year 1980	Fiscal year 1982
Major items:		
Chemical agent alarms.....		
Decon equipment.....		
Combat vehicle filters.....		
Collective shelters.....		
Modular shelter equipment.....		
Individual:		
Overgarments.....		
Footwear covers.....		
Gloves.....		
Detector kits.....		
Decon kits.....		

[Deleted.]

Medical treatment by the individual soldier for chemical agent effects remains a [deleted.] While life-saving measures are available for nerve agents, they in themselves present [deleted] to the soldier and his operational capabilities. An accelerated research and development program to develop more effective or new antidotes and/or prophylactics for all threat chemical agents is underway by the Army's medical Research and Development Command.

Senator WARNER. Dr. Wade, how do you rate the prospects for supporting prolonged chemical operations in Europe through/in view of the serious deficiencies which exist in defensive CW war reserve stocks?

Dr. WADE. Much has been done to correct the U.S. Army's chemical warfare defensive deficiencies, yet [deleted] in a chemical warfare environment are not yet possible due to a [deleted]. The U.S. Army's forward deployed and early deploying combat forces should now be able to survive an enemy's first strike with toxic chemicals. However, prolonged chemical operations beyond [deleted] hours in Europe are not yet possible. Logistical support units do [deleted] the collective protective systems necessary for rest and relief to sustain operations, [deleted]. These deficiencies, in addition to the limiting aspects of the equipment itself, i.e., shelf life, maintenance, servicing, preclude the Army from achieving a sustainable NBC readiness posture.

In order to provide this capability, the United States must increase its war reserve stocks of protective clothing and equipment, while developing new items to [deleted] operational degradations. Since the current Army program will not provide adequate quantities to support [deleted] days of operations until the [deleted] the prospects of supporting prolonged CW operations is [deleted]. Therefore, the key is to deter the use of chemical weapons in war through the capability of retaliating with a creditable stockpile. In our case, this would be provided by the modernization of the stockpile with binary weapons.

Senator WARNER. Dr. Wade, from what we know of Soviet doctrine, is there any reason to believe that they are disposed not to use their CW advantage if it will serve their purposes?

Dr. WADE. No, in my view, they most certainly would use it. At the highest level of generalization Soviet national strategy is one of war survival; the long-term emphasis on civil defense and military superiority reflects their intention to survive and recover from any general war. We believe that the Soviet armed forces currently have significant quantities of chemical weapons for use, and they, as well as those of the other Warsaw Pact countries, are well organized, equipped, and trained to protect themselves in a CW environment. Many evaluations of the Soviet threat concentrate on scenarios of a general war between the Warsaw Pact countries and the NATO allies, with a possible Soviet preemptive attack through West Germany. The NATO forces currently [deleted] The Soviet CW threat is [deleted] proportional to NATO's ability to survive and retaliate. To attain important military objectives in any future conflict, it would be to the Soviet's [deleted] on enemy forces and airfields. As long as the NATO forces are [deleted] the Soviets, in accordance with their military doctrine of high mobility, could [deleted] Western Europe before NATO forces could [deleted] CW capability.

Senator WARNER. Dr. Wade, have alleged Soviet and Soviet proxy chemical warfare attacks in the Third World suggested a willingness to make such use of chemical weapons?

Dr. WADE. Yes, the probable Soviet involvement in the use of chemical agents in Southeast Asia [deleted], and the direct purported use by Soviet forces in Afghanistan, indicate a willingness to employ chemical weapons whenever the Soviets believe such employment will be advantageous to them.

Senator WARNER. What is trade-off from the standpoint of operational flexibility involved in increasing the yields of theater nuclear weapons?

Dr. WADE/Gen. FULWYLER. In planning the employment of nuclear weapons, it is essential to apply the necessary degree of damage while causing minimum collateral damage including civilian casualties. Consequently, there is a trade-off between target damage and troop safety/collateral damage limitations, all of which are basically a function of weapon yield.

In order to explain the trade-off, let me use the table below:

Weapon	Yield (kilotons)	Radius of effect		
		Lethality ¹	Safety ²	Collateral damage ³
Lance (W70-4)-----	[Deleted.]			
Lance (W70-3)-----				
Lance (W70-2)-----				

¹ Radius of damage—3,000 yds to personnel in tanks.

² Radius of safety for warned, protected, friendly troops.

³ Radius of collateral damage to single story masonry buildings.

By increasing the yield from [deleted] there is a [deleted] increase in the radius of damage; however, there is a [deleted] increase in the radius of safety and a [deleted] increase in the radius of collateral damage. Therefore, for the larger yield, the weapon must be employed farther from friendly troops and there will be significantly greater collateral damage. These factors could preclude using the larger yield in various tactical situations or could force the commander to accept less target damage in order to meet troop safety and collateral damage limitations.

The Army has considered these limitations in developing its modernized warheads by emphasizing the need for reduced blast/enhanced radiation (RB/ER). For the [deleted] RB/ER yield in the modernized warhead, the radius of damage approximates that of the [deleted] warhead but the troop safety and collateral damage radii are about the same as those for the [deleted] warhead. Therefore, the RB/ER warhead allows greater operational flexibility by permitting the use of smaller yields to achieve the required target damage while reducing the troop safety hazard and collateral damage potential.

Senator WARNER. What steps are needed to maintain confidence in the reliability of our chemical weapons stockpile? To what degree is it possible to take those steps within the present statutory limitations? Is the Administration planning to take such steps?

Dr. WADE/General FULWYLER. As you know, our current stockpile contains some munitions which date back to World War II. In fact, the most modern munitions in our retaliatory stockpile are the Navy's Weteye bombs which were filled in 1969. It was during this same time frame that we terminated live certification firing of our chemical munitions. Since that time serviceability has been determined by a special surveillance program consisting of agent sampling and explosive component testing. Agent sampling consists of drilling into a munition, withdrawing agent and analyzing the agent for purity. Testing of explosive components has been incorporated into the conventional munitions stockpile reliability program when a commonality of components exists.

Based on this type of reliability criteria, we estimate that of the current munitions stockpile of [deleted] agent tons, only [deleted] tons are in serviceable condition. The remaining [deleted] agent tons are considered unserviceable but repairable. In this regard, we have initiated a maintenance program to repair these munitions by FY87. However, in my opinion, continued obsolescence and deterioration will continue to reduce the stockpile which at best will be about [deleted]

agent tons of usable munitions by the late 1980's. Obviously without live certification firing, actual serviceability of a munition cannot be guaranteed. Deterioration of munition components is known to be effected by reaction of the agent fill. The ballistic inferences of this degradation cannot be determined in the absence of live fire testing. Such tests are permitted under current laws.

Public laws enacted subsequent to 1969, Public Law 91-121 and 91-441, do, however, require that a declaration of national defense necessity be made by the Secretary of Defense, and that the Department of Health and Human Services review the particulars of any live fire testing program. These laws also provide for a congressional review and notification of other Federal, state, and local officials.

Based on OSD guidance, the Army is conducting an assessment of its total testing program in order to verify what, if any, live agent testing is required. Since this review has not been completed and an Army position established, any speculation on my part with respect to an Administration's policy regarding resumption of live agent testing would not be proper.

Senator WARNER. To what degree, if any, is legislative relief needed from current laws regarding transportation and disposal of toxic chemicals?

Dr. WADE/General FULWYLER. At the present time, I see no need for immediate relief from the provisions of the applicable laws. Public Law 91-121 enacted November 1969, as amended by Public Law 91-441, October 1970, do not prohibit either transportation, testing or disposal of toxic chemical agents and munitions. They do require, however, that prior to the conduct of these type operations, that the Secretary of Defense declare that the movement, test or disposal is in the interest of national security. The Army has successfully conducted both movement and disposal operations under provisions of these laws. We have not, as you know, conducted any live agent testing since 1969. We will continue to address these types of operations and requirements on a case-by-case basis.

Senator WARNER. Are special efforts being made to prepare the RDF for CW operations?

Dr. WADE/General FULWYLER. RDF units enjoy a high priority among Army forces for improvements in force structure, equipment and training resources. Therefore, the RDF tends to receive new equipment, chemical defense units and chemical specialists ahead of most of the rest of the Army. In general, most of the chemical defense improvements within the RDF are a result of its high priority for Army wide programs rather than special efforts for the RDF. One major exception is a proposed buy of new protective masks which has been included in the Army's fiscal year 1981 Supplemental request to provide a one time complete new issue for the RDF.

Certain aspects of the RDF mission do require special efforts. The need for light, air transportable equipment and the impact of water based decontamination in the desert environment are among the issues being considered. The analyses of these issues is driving new equipment development and the organization of chemical defense assets within the RDF to improve its overall capability.

Senator WARNER. Dr. Wade/General Fulwyler, do the light armor initiatives, which this Committee has vigorously supported, and which are well suited to RDF operations, have as a design requirement collective chemical protective equipment?

Dr. WADE/General FULWYLER. The Draft Required Operational Capability (ROC) document for the Mobile Protected Gun (MPG) as a near term solution supports a design requirement for a NBC collective protection system.

The Mobile Protected Gun ROC has not been done for the long term. However, the requirement for a NBC collective protection system is anticipated.

TNF C³ IMPROVEMENTS IN EUROPE

Senator WARNER. Dr. Wade, what steps are presently programmed to redress [deleted] vulnerability features of the TNF C³ system in Europe?

Dr. WADE. We have recognized that the current C³ systems supporting the Theater Nuclear Forces (TNF) in Europe [deleted].

To alleviate these deficiencies we have undertaken an evolutionary, three phase improvement program with the objectives of attaining a wartime survivable system by the late 1980's. In phase one, which should be completed by the end of [deleted] at a cost of \$15M, we have focused on upgrading the reliability, responsiveness and security of the critical communications links [deleted] to [deleted] units. The terrestrial, voice conferencing system, the

European Command and Control Console System (ECCCS), which connects major headquarters to [deleted] is being expanded [deleted]. A [deleted] capability is also being incorporated into that system. In the high frequency (HF) radio net that [deleted] new radio equipment is being installed [deleted] and frequency management equipment is being procured.

In phase two of our program, which basically extends from [deleted] we are building onto the phase one HF radio enhancement by adding new, more reliable equipment [deleted]. We are also deploying [deleted] to these sites to provide an alternate communications capability to improve overall survivability. The phase two improvements are programmed at a cost of \$112M.

Our phase three program is designed to [deleted] C³ system. It is based on the recommendations of a comprehensive Theater Nuclear Weapons (TNW) C³ System Improvement Plan (SIP) which was completed in December 1980. We intend to implement the plan's key recommendations which call for improvements in a mix of communications means, facilities and automated aids.

While most of the recommendations will be programmed for in the [deleted] period, we have \$23M in the fiscal year 1982 budget to begin the program. We have funded for [deleted]. We also have funds to increase the communications links in the Defense Communications System and increase the number of leased circuits in allied systems to provide additional TNF support. In addition we would begin development to realize a [deleted].

C³ INFRASTRUCTURE TO SUPPORT SECOND STRIKE OPERATIONS

Senator WARNER. Dr. Wade, what additional steps are required to ensure reasonable confidence in having a C³ infrastructure capable of supporting second strike operations? What are the costs of such steps and the prospect for obtaining NATO infrastructure funding for them?

Dr. WADE. First, we must continue in fiscal year 1983 and beyond to implement the key recommendations in the TNW C³ System Improvement Plan which relate to the survivability of command centers, command and control functions and communications. Having survivable and enduring command centers and alternates and a viable means of interconnecting among them and with the National Command Authorities (NCA) is a first prerequisite [deleted]. The costs of such improvements would be [deleted] dollars over a five year period.

The next step must be [deleted].

[Whereupon, at 12:33 p.m., the hearing was terminated.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, FEBRUARY 25, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

LAND-BASED DETERRENT (MX)

The subcommittee met, in executive session, pursuant to notice, at 8:32 a.m., in room 212, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Present: Senators Warner, Thurmond, Goldwater, Jepsen, Quayle, Stennis, Cannon, Nunn, and Exon.

Staff present: Rhett B. Dawson, staff director; William L. Ball III, chief clerk; Christine F. Cowart, assistant chief clerk; Francis J. Sullivan, Edward B. Kenney, Ronald F. Lehman, E. George Riedel, James C. Smith, Frank J. Gaffney, Jr., professional staff members; Ralph O. White, research assistant; Marie Fabrizio Dickinson, Brenda K. Hudson, and Judith P. Hunt, clerical assistants.

Also present: Chris Lehman, assistant to Senator Warner; Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Arnold Punaro, assistant to Senator Nunn; Greg Pallas, assistant to Senator Exon; Peter Lennon, assistant to Senator Levin; and Willis Smith, assistant to Senator Jackson.

OPENING STATEMENT BY SENATOR JOHN WARNER, CHAIRMAN

Senator WARNER. The subcommittee will come to order.

Today, the subcommittee meets to receive testimony on the fiscal year 1982 Defense Department authorization request relating to our land-based missile deterrent, and especially the MX missile program.

I would like to welcome to the subcommittee Gen. Lew Allen, Chief of Staff of the Air Force. His presence here today symbolizes the high priority which the U.S. Air Force places upon the need for ICBM modernization.

I would like to also welcome Dr. Seymour L. Zeiberg, the Deputy Under Secretary of Defense for Research and Engineering; and Lt. Gen. Kelly Burke, the Deputy Chief of Staff of the Air Force for Research, Development, and Acquisition.

The purpose of our hearing today is to establish the current status

of ICBM modernization and the MX missile program. General Allen will testify as to the priority the Air Force should give to the MX program; Dr. Zeiberg will discuss the Reagan administration's review of MX basing; and General Burke will discuss programmatic details of the MX program to include the draft environmental impact statement and the split basing study.

For many years our land-based deterrent of Minuteman and Titan missiles has been the most cost-effective component of our strategic Triad. Recent improvements in the accuracy of Soviet warheads and the great increase in their numbers have created the so-called window of vulnerability in which a larger and larger portion of our land-based missiles may be vulnerable to attack.

The major U.S. response to these developments has been the MX. As you are all aware, the preferred Air Force program calls for the deployment of 200 new MX missiles in a multiple protective structure (MPS) system of 4,600 shelters, to be located in the Great Basin region of Nevada and Utah. Last year the Congress directed in law that the Air Force proceed with such a system but provided that construction would be divided into an initial phase of not more than 2,300 shelters and a follow-on phase for the remainder.

At that time, the Congress also requested a "split basing study" of options for basing part of the system outside the Great Basin. That study has been received by the Congress and concludes that split basing is operationally feasible but would cost about \$3.5 billion (in constant fiscal year 1980 dollars) more to acquire. In addition, annual operations and support costs would increase by about \$19 million.

If Congress were to mandate split basing, then according to the Defense Department study the second half of the system will be placed in the High Plains region of west Texas and New Mexico. Thus far, no overwhelming operational reasons have been given for or against split basing. Thus, if the Congress wishes to mandate split basing it will do so on the basis of the environmental impact. Recently the draft environmental impact statement on MX was released and we are presently in the comment period.

MX BASING FEATURES AND DRAWBACKS

At the present time the Reagan administration is undertaking a review of MX basing and I hope that we will have the results sometime this summer. Frankly, I cannot think of a weapon issue which has been so heavily studied as the question of how to base the MX missile. Over 30 major approaches, with many variations each, have been studied in depth over the last 10 years in hopes that an alternative to MX MPS basing could be found. Thus far, alternatives which would provide a survivable ICBM force in the same time frame and meet the same requirements have not been found. Each and every concept which is put forth has attractive features but also significant drawbacks.

As time goes by, new technologies or alternative approaches may present truly viable alternatives. Our subcommittee is open to such options and will vigorously seek them out, but I earnestly believe that we should not delay the on-going MX program in hopes that we might suddenly find an acceptable alternative. We should, however, continue

to invest in new technologies and programs, like ballistic missile defense (BMD) which in the future could result in reducing the number of shelters which would ultimately be required. In my view, more information is needed before we could commit to BMD as a replacement for the MPS system.

Some people suggest that we do not need to have the MX missile in a survivable land-based mode. They would have us launch the missile upon warning of a Soviet attack, or they would have us move our ICBM capability to sea.

By now, you have heard many discussions concerning the dangers associated with launch under attack and the dangers of abandoning a survivable ICBM force as part of the strategic Triad. I will not engage in a long discussion of the strategic Triad and our nuclear force requirements, but I will say this: I do not believe that we can or should define away the requirement for a survivable land-based missile force. If the requirement is real, then the question of ICBM vulnerability must be addressed head on. These, then, are some of the questions which we must again address today.

There being no objection, the subcommittee will go into executive session, for reasons of national security. The Chair has invited Senators from all of those States that either now or under various proposals could have a unique connection with respect to the possible basing modes of the MX system. This invitation, however, has been restricted to Senators because of reasons relating to classified material which will be discussed.

General, we are delighted to see you this morning, and your two colleagues who have stood by your side throughout this long controversy. Let us hope that we can resolve it in the very near future.

General ALLEN. Thank you.

Senator WARNER. I have every reason to believe that this session will be—as it is an executive session—one in which you can freely disclose your thoughts without any fear of those personal notes or professional thoughts or official thoughts departing at a later time. I anticipate that we will have a subsequent hearing on this subject and the Senators, of course, will be making public statements.

If you will proceed—

STATEMENT OF GEN. LEW ALLEN, JR., CHIEF OF STAFF, U.S. AIR FORCE, ACCOMPANIED BY DR. SEYMOUR ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING; AND LT. GEN. KELLY BURKE, USAF, DEPUTY CHIEF OF STAFF, U.S. AIR FORCE, FOR RESEARCH, DEVELOPMENT, AND ACQUISITION

General ALLEN. Thank you.

We are pleased to be here today. I have a statement which I would like to submit for the record. It is an unclassified statement and it is prepared that way for such convenience as it may provide to you.

Senator WARNER. Without objection, it is received.

[The prepared statement of General Allen follows:]

PREPARED STATEMENT OF GEN. LEW ALLEN, JR., CHIEF OF STAFF, USAF

LAND-BASED DETERRENT

Mr. Chairman, members of the subcommittee, I am especially pleased to appear before you today to testify on our plans for modernizing the land-based missile force and in particular on the status of the MX program.

The Soviets confront us with a truly formidable military challenge. Decades of massive military spending have fueled a relentless build-up of Russian military might. Across the full spectrum of military capabilities the Soviets are applying ever increasing resources to the development and deployment of weapons which increase both the size and quality of their mammoth military arsenal.

Nowhere is the challenge clearer or more dangerous than in the area of strategic nuclear capabilities. Led primarily by the growth and improved accuracy of their ICBM force, the Soviets have wiped out the significant strategic nuclear advantages long enjoyed by the United States. At present we find ourselves in a position of tenuous parity. And given the superior momentum of Soviet strategic arms programs, our position will deteriorate further over the next few years before we are able to turn it around. Yet I'm greatly encouraged by the signs that the mood and support in the country regarding the need for increased military strength has shifted dramatically and by the Regan administration's commitment to rebuild the nation's defenses.

This tenuous parity in the strategic balance, the strong momentum of Soviet arms efforts and the threat to our Minuteman ICBM's vividly demonstrate two key points which I would like to discuss this morning. One is the proposition that we must not allow the Soviets to achieve a position of clear-cut nuclear superiority lest they be tempted to capitalize on their relative strengths and take truly precipitous steps toward their expansionist goals. The other is that our continued ability to cope with this greatly expanded Soviet threat fully demonstrates the strength and stability we have obtained with our strategic Triad.

TRIAD

First, regarding the Triad:

For more than 20 years the central tenet of the design and acquisition of our strategic deterrent has been the maintenance of a balanced Triad of land-based missiles, submarine-based missiles and long-range bombers. We have carefully structured our forces so that these systems complement each other—enhancing and building upon one another's strengths and capabilities; compensating for the weaknesses which are also present in each. To defeat the Triad, an enemy would have to attack successfully each system simultaneously—an extremely difficult task. Moreover, to protect himself from a devastating retaliatory response he would have to defend successfully against attacks from each as well. And in the long run, to develop such capabilities, the Soviets would have to devote very substantial amounts of funds, people, and material, among all these mission elements. Triad diversity also protects us against technological failures within one system, or an unexpected technological breakthrough by the Soviets which allows them substantially to threaten one of its elements.

This latter case is much the situation we now face. The massive Soviet investment in ICBM's has paid off. The accuracy of their multiple warheads has improved much more rapidly than was predicted. Few continue to debate the vulnerability of Minuteman—under certain conditions we stand to lose up to 90 percent of what General Ellis has called the "centerpiece" of our deterrent. Yet this situation vividly demonstrates the wisdom of developing a Triad. While our overall retaliatory capability is diminished, it has not been reduced to the point where the Soviets could prevent a devastating U.S. nuclear response. Thus the positive side of our predicament has been its reaffirmation of the value and indeed the necessity of maintaining a strategic nuclear Triad.

The other major point I referred to earlier is that we cannot allow the Soviets to achieve and maintain a position of unambiguous strategic nuclear superiority. We must recognize clearly the importance of strategic forces—their utility extends far beyond the prevention of full-scale nuclear war. Strategic forces are, of course, designed and deployed to deter such a conflict. But strategic forces represent much more. They are the very cornerstone of our military strength. Their retaliatory capability provides the foundation for the confident deployment of our conventional and theater forces and, in many ways, influences the direction and conduct of our foreign policy. The Soviets also recognize the impor-

tance of these forces and view the strategic nuclear balance as a central measure of their status as a superpower. As the Soviet Union has become our equal in strategic nuclear strength, they have become more willing to brandish and employ their overall power, to take greater risks, and to make greater efforts to expand and consolidate their gains throughout the world. The brutal invasion and occupation of Afghanistan bears stark witness to the growing self-confidence of the Soviet leadership, and their increased willingness to rely upon armed force as a means to attain their foreign policy goals.

STRATEGIC FORCES

Strategic forces matter. They are a central element that lends credibility to our foreign policy commitments. As a new generation of Soviet leaders inevitably emerges over the next few years, they must be made to understand that the United States will not permit them to accumulate superior nuclear capabilities or allow them to pursue their aggressive goals unopposed.

The key to restoring a credible Triad and reestablishing the strategic balance is the deployment of a capable strategic nuclear force, in particular, a survivable, land-based ICBM capability. Failure to correct the vulnerability of our Minuteman force would send a very strong signal to enemies and friends alike that we are willing to acquiesce to superior Soviet strength. In addition, we would be abandoning the real and unique military capabilities of this element of the Triad. These strengths of the ICBM are well known: proven, secure and redundant C3; timely, effective military capability; high alert rates; high reliability; low operating costs; and perhaps most importantly, independence from warning.

The program the Air Force has been pursuing to redress this imbalance is, of course, the MX. Unlike many of the other alternatives considered, MX deployed in the multiple protective shelter, or MPS, basing mode, not only provides for survivability of the ICBM force, it does so in a manner that preserves the military characteristics that give ICBMs their value. Further, MX in MPS, while expensive, is less so than many other alternatives and its expense is consistent with that of previous strategic programs.

I want to assure the committee that the Air Force remains firmly committed to the development and deployment of the MX. During the past year we have made significant strides in the development of both the missile and the basing mode. We have successfully test fired the rocket motors, we are confident of the guidance system, and we are exploring more economical means to construct the shelters. We have published the Draft Environmental Impact Statement for deployment area selection and submitted a split-basing study to the Congress. Full-scale engineering development is in full swing. The risks are low, the technology seems well in hand.

During the past year we have also made significant improvements in the system design—after all, that is the purpose of the engineering development phase. The most important improvement deals with the missile transporter-erector-launcher, or TEL. Working with a special panel of the Defense Science Board, we concluded that the large integral TEL could be replaced by a smaller system where only the missile with its erector-launcher need be inserted in the shelter. This allows the shelter to be smaller, the transporter to be smaller and simpler, and improves our ability to maintain concealment through the use of simulators. We have made further refinements which reduce the environmental impacts by eliminating the automatic dash feature which in turn allows more efficient layouts of the shelters.

We have also made significant improvements in understanding and reducing the environmental impact of MX. The Draft EIS to support deployment area selection is published and it indicates that the various ecological, economic, and social impacts, while significant, are manageable. We have had a promising find of water at the preferred base location near Coyote Springs in southern Nevada. We are forming a series of working groups to address many of the topics of special importance to local citizens: job training, transportation, ranching and mining.

The message I want to leave with you is twofold. First that we understand the system technically and militarily—we know how to build it efficiently, and we know that it will be effective. Second that we are sensitive to the social and environmental problems that MX could bring to the deployment area. We are doing our very best to minimize and mitigate the possible adverse impacts and

to expand and capitalize on the positive benefits that will surely accrue to the deployment area. By working closely with those who will be most directly affected, I am confident that the benefits to the local area will far outweigh the negative aspects of the system.

We did not come to the present basing mode design lightly. Over the years we have studied in considerable detail about 35 different designs and many more variations on these. The Air Force is confident that of all those studied the present concept of horizontal multiple protective shelters is the best possible solution to a many dimensioned and difficult problem. This is not to say there won't be further design improvements as we get closer to production; this is the natural process during system development.

The new administration is taking steps to thoroughly review the Nation's strategic modernization efforts including the MX program. There may be adjustments in the design as result of this reexamination of the basing mode directed by the Secretary of Defense. The Air Force is fully supportive of this effort. While we undertake this detailed reexamination of the basing mode, we are moving forward with the program to avoid further delay in fielding a survivable ICBM. The country cannot afford further delays. The threat to Minuteman is real and the strategic balance continues to deteriorate.

In conclusion, I want to restate the conviction of the Air Force and the Joint Chiefs of Staff that a survivable land-based ICBM is critically needed to redress the strategic balance and maintain a stable deterrent. Based on many years of detailed study we are convinced that the MPS concept offers the best solution. During development we will continue to refine the system with the expectation of avoiding unnecessary costs and increasing effectiveness. I ask for your continued support to move forward with MX at the fastest pace possible.

Senator WARNER. Is there any intention on your part of releasing it?

General ALLEN. No, sir, not on mine.

Senator WARNER. Well, I would just as soon not release it either, because I want to give my colleagues the full opportunity to look that statement over and make comments as they see fit. As far as I know, there is no precedent for that.

General ALLEN. We have copies of it here. In any event, Mr. Chairman, it is your decision as to whether you find that useful as unclassified or not. It is acceptable for release as far as I am concerned, but I would not make any such release without your direction to do so.

Senator WARNER. I don't assume to control your activities. I just want to know by way of information, and I would want to inform my colleagues if you were going to make a release.

General ALLEN. I would not do that unless you elected to make some suggestion.

Senator WARNER. I would suggest you let this subcommittee have this hearing and a subsequent hearing, and perhaps at that time we can make a statement.

General ALLEN. Then, with your permission, since we are now in closed session, I would like not to present this to you, but instead talk to it, and then my remarks will include classified information.

STRATEGIC BALANCE BETWEEN U.S.—U.S.S.R.

First of all, with your permission, I would like to say just a word or two about the status currently of the strategic balance between the United States and the Soviet Union.

It has appeared in the press and elsewhere that there are differing views on how to state that. I have used the phrases, "tenuous parity" or "essential equivalence" from time to time, and Mr. Weinberger has spoken of a lesser characterization of that. General Ellis, I believe, in

recent testimony, spoke of it in a manner which was generally less favorable than that.

IMBALANCE CONCEPTS

Senator WARNER. Let us get into the record your recollection of Mr. Weinberger's statement. He said with respect to our strategic forces we are in a situation of imbalance. He has used the word "imbalance." My recollection of briefings with General Ellis was that he subscribed to the very words used by Mr. Weinberger. I don't believe he added any emphasis or moved it another degree or two in that direction. You were present. Do you have any recollection?

Mr. CHRIS LEHMAN. I think that is what he said.

Senator WARNER. He has definitely alined with Secretary Weinberger, and if anything gone a little step further. That is my understanding. Do you share those views? I mean, do you share that recollection of how those individuals referred to it. And General Jones, was that his statement?

General ALLEN. General Jones and I use the same terminology, and we have developed that through the discussions and preparation of the Joint Chiefs of Staff, so we would attempt to use the same description of it as the description used by the Joint Chiefs.

The point I wanted to make, sir, just in discussing this issue with you, is that all of us are working from the same set of data. I have some of that descriptive data before me today. I want to reassure you that there are no disagreements among us as to the facts of the balance, but only how to gather up those facts into a single descriptive term.

Senator WARNER. Let me press that point. I think the word "gather" is not the way I expected you to say it. If I understand your statement, the data base is uniform?

General ALLEN. Yes, sir.

Senator WARNER. The conclusions, however, differ, based on the individual and you are entitled to a different conclusion. Would that be correct?

General ALLEN. The difficulty, I think, comes in trying to put a precise term on a concept which is measured in a number of different ways. I wanted to describe a little bit about the different ways of measuring so that you can visualize how these differences in statement about the balance arise. I think in many cases the description we attempt is largely a theological one. That is, we are arguing a little bit about how many angels can dance on the head of a pin. It is an interesting point and important discussion, but it tends to obscure reality. We all agree that the strategic balance is not as favorable for the United States today as it has been in the past, and there is no issue about that.

Senator WARNER. If I may interrupt for just a minute, General Allen. Senator Cannon, we have just started. We have received the public statements made by Secretary Weinberger in which he said we were in a situation of imbalance, strategically, and General Ellis by and large shares that view, and has articulated his thoughts in much the same way. General Allen is pointing out he and General Jones take the same data base and articulate in a somewhat different manner.

Is that correct?

STRATEGIC TRENDS UNFAVORABLE

General ALLEN. That is correct. We all agree that today's balance measured by any number of different ways is not as favorable as it has been in the past. There is no disagreement whatever about that.

Second, we all agree that the trends are unfavorable for the United States and that that is clearly because of the great momentum and pace of the Soviet buildup.

Third, we agree that the programs which are presently planned are the minimum essentials to maintain any reasonable balance between the United States and the Soviet Union, and that that conclusion is tenuous because it is based on the presumption that our previous estimates of Soviet behavior will turn out to be correct. Those previous estimates did, in fact, have constraints in them which are subject to question. That is the extent to which the Soviets will fractionate their ICBM's; whether or not they will restrain their bomber program or introduce a new bomber; and certain assumptions on the rate at which they will introduce SLMB's into the force.

The United States must consider the possibility that the Soviets could significantly increase the threat over that which we forecast last year when we drew our conclusions about projected essential equivalence. So we are all agreed that the situation is not good and the situation will not be better unless we take strong and resolute measures to match the Soviets with regard to what they are doing now, and be prepared to match them in what they may do in the future to maintain some reasonable balance.

STRATEGIC ALERT FORCES

When one examines this specific question of how do you describe the balance today, there are a number of measures that we use. For example, if we examine the day-to-day strategic alert forces of the United States compared to the day-to-day alert forces of the Soviet Union, prior to any exchange, we find that the United States and the Soviets are today about equal in the number of weapons, and that is worse than it was in the past.

We find that the Soviets have, as they have had for some time, a substantial advantage in equivalent megatonnage. They have larger yield warheads which gives them some advantage.

Now, our forces are not entirely the same; that is, we have emphasis on the bomber leg of the Triad, and the Soviets have great emphasis on the ICBM leg of the Triad. That means that when we generate forces and when we come to a higher status of alert, our forces increase in capability more than the Soviets' do. On the other hand, it means that at different times of measurement the Soviets have more counterforce capability than the United States does because of the greater emphasis on accurate weapons.

So when we look at generated forces, the United States is somewhat better off in terms of number of weapons, and the Soviets still have an advantage in terms of equivalent megatonnage.

In day-to-day alert, largely that advantage in weapons on line has disappeared and we are roughly equal, perhaps a little bit deficient,

in terms of weapons on alert status. In all cases we become less than fully equal in terms of counterforce potential value.

Senator WARNER. Having just been to SAC, I fully appreciate, and I know Senator Cannon does, the terms of alert. But those who may go over the record may require the benefit of the definitions here.

STRATEGIC FORCES STATE OF READINESS

General ALLEN. The United States maintains strategic forces in a certain state of readiness on a day-to-day basis. For the ICBM's that is a very large number, roughly [deleted] percent or more. In the case of the bombers, the United States has for a number of years elected to maintain the bombers on a 30-percent day-to-day alert status. That means that 30 percent of our bombers are ready for launch on very short warning.

The other portions of the bomber fleet can be raised to that alert status on various kinds of warning or increased concern in the country. The submarines are on [deleted] percent alert status, depending upon the way in which one views some of the submarines. They can for a somewhat longer period of time be raised to a higher status of alert.

When we generate forces either because of warning or because of decisions which the National Command authorities make, we can raise the status of those forces to much higher numbers. Then, when we speak of generated alert forces, we speak of a higher ratio of our forces ready for instantaneous launch.

The United States, having a large bomber force, has a significant capability to generate force quickly. The Soviets have a higher status of day-to-day alert because of their emphasis on ICBM's but have less capability to generate additional forces.

Senator WARNER. Thank you.

General ALLEN. So when we measure the strategic balance between the United States and the Soviet Union, we find, or at least I find, it acceptable to say that we are in a state of rough parity, with some advantages for the United States and some advantages for the Soviet Union. That measure may be significant in terms of the world's perception of the balance between the Soviets and the United States. That is the measure of the strength of the forces as they exist in peacetime. But, clearly, we need to look at other factors as well. For example, what happens during the actual prosecution of a war and how well are these forces able to execute what may be required of them. Then one reaches other conclusions about the balance.

U.S. RETALIATORY CAPABILITY

One measure has been, can the United States withstand a Soviet first strike and still retaliate in such a way as to inflict unacceptable damage on the Soviet Union? We are still able to do that, so by that measure our retaliatory strength remains acceptable. That measure, for example, is very largely the result of the survivability of the SLBM force.

We seldom look at the capability of the United States to inflict a first-strike damage on the Soviet Union, and that is in general not

a measure of the balance between the United States and the Soviet Union, because we choose not to look at it in that particular way.

The United States does have some first-strike capability against the Soviet Union, obviously not enough to cause them to be unable to retaliate.

Another measure of examining the balance is to ask the following somewhat artificial question. That is: If the Soviets should strike the U.S. counterforce and attempt to destroy our strategic missile capability, would they be ahead of the game? Would they have more alert weapons left in the Soviet Union than we had surviving that attack?

Now, one could question whether that is really a valid measure of fighting a war, but it is one of the ways we use to insure that we have built the right characteristics into our force and that the Soviets are deterred for each level of conflict that they might think about. In that particular circumstance the United States ability to survive that exchange has been decreasing as the vulnerability of our ICBM leg has increased. The Soviets have developed a greater ability to take out our ICBM's and we now have less ability to destroy their residual weapons in counterforce retaliation.

It is perhaps that fact, I believe, that has led General Ellis to describe our existing strategic balance as being less than satisfactory.

I think Mr. Weinberger was perhaps reflecting the same general kind of view.

Whatever one thinks to be the right description of the balance, the conclusion is the same: The conclusion is that one of the highest priority activities of this Nation must be to restore that situation in our favor. We cannot allow the asymmetry caused by the large number of accurate Soviet ICBM's, and the vulnerability of U.S. ICBM's, to continue any longer.

SUMMARY

To summarize, for a whole set of reasons I believe that I have a clear responsibility in open testimony and in comments before the press or the public to describe the United States strategic situation with respect to the Soviets as one of rough equivalence. I recognize differing views in that, as a matter of substance and as a matter of detail, and I have attempted to describe how that comes about.

On the other hand, I also have a responsibility, I believe, in the public discussion to not describe the United States forces as being inferior to the Soviet Union, to any degree that truth permits me to, in order not to exacerbate a situation which is already unpleasantly in favor of the Soviet Union.

So my conclusion is that you will probably continue to hear differences in this description. I do not despair of that and I tend not to seek resolution of it, only to seek understanding of how these differences arise.

SERIOUS STRATEGIC NUCLEAR FORCE PROBLEM

The real conclusion one must reach in this closed room is that the United States does face a very serious strategic nuclear force problem. That problem is characterized by a situation which we are facing over a period of time, where the Soviets' perception of an ad-

vantage for a preemptive first strike is much higher than it has been in the past. And it is at a point, while perhaps not dangerous in that it will incite them to first strike, it nevertheless gives them confidence in their nuclear forces. That confidence means that we will find the threshold of nuclear war much higher than in the past, and we will see greater Soviet confidence in their ability to be adventuresome and provocative to the United States across a broad range of areas.

That characterization of the strategic balance is bad and needs to be corrected.

Senator NUNN. I don't want to interrupt from the main purpose here, but General Ellis was here the other day and I had to leave, and I would like to ask one question, maybe a little bit off course: General Allen, we heard testimony from the Navy, Admiral Hayward, that naval balance of power has shifted from one that was slightly in our favor to one that was in a vague area, and the thing that was disturbing about that is that that all happened in a 4- or 5- or 6-month period, in terms of changing the view of that.

NAVAL POWER ANALYSIS

In the course of that dialog, it was brought out that Admiral Hayward and his Navy team had done the analysis on naval power. I have talked to SAC people and I have talked to Air Force people and talked to you and others about the use of land-based air in the overall naval equation. No. 1, was the Air Force part of any kind of analysis of our overall maritime balance of power? And, No. 2, should the Air Force be a part of that analysis? And, No. 3, what role would the Air Force, including our strategic force, be capable of playing in a conventional maritime showdown?

General ALLEN. The answer to question 1 is no, not in any formal way. However, I would think that the informal contacts and actions we have all of the time were very much a part of the consideration which the Navy gave to it.

The answer to No. 2 is really the same. I am not convinced that it is particularly useful for the Air Force to be a formal part of a Navy examination of balances in naval power; but it is important that the Air Force capability to contribute to it be well understood by the Navy and considered in any evaluation they make.

AWACS

Now, the answer to No. 3 is "several." The first of those—and Admiral Hayward and I have exchanged secret correspondence on this within the last day or so—is the contribution of the Air Force early warning system, AWACS, to the projection of the threat from land-based air, particularly the Soviet Backfires. These bombers present a very serious problem for naval operations in the [deleted].

Admiral Hayward is particularly anxious that we better develop the discipline and allocation of those assets to that role. We have done this in many exercises.

He is also anxious that we work together to increase the number of AWACS aircraft in order to assure him the appropriate support for protection of that fleet against the threat.

AIR TO SEA MISSILES

Now, another way in which the Air Force can clearly assist is by using long-range aircraft to kill enemy ships. We have done that with the B-52's in developing a GBU-15 capability against ships, but it is not a very good capability. The GBU-15 isn't a very good weapon against ships with good anti-aircraft defenses because it doesn't have quite enough standoff capability.

So we will continue to work with the Navy on Harpoon, but that missile will probably also lack the range that we would like for use with either FB-111's or B-52D's. We will then look at other standoff weapons, like Tomahawk-class weapons, to see if those can be projected rapidly from anyplace on the globe to counter Soviet naval forces and assist our Navy.

Senator NUNN. I guess my point is, if I might ask one more question on this, Mr. Chairman, are you confident, or have you examined the Navy's overall analysis on this, and have you found that the Air Force is plugged into the equation, that your true capabilities in this respect have been taken into account; or do you and the Navy have a difference of opinion about what the Air Force would be able to do?

General ALLEN. I don't think we have any real differences of opinion on the matter. No. 1, as I said, we are part of the Navy's continuing examinations. We agree on the need to address the question of early warning for fleet protection.

The Navy is very concerned about the threat of the Backfire, and the standoff weapons when they are operating close to shore, so that the ETU will not do the job.

The second question is the projection into various oceans of ship-killing capability. In that particular area we did do that work on the B-52's with the GBU-15's. I think that has not been received by the Navy with a great deal of enthusiasm, nor by us, as it turned out, because the GBU-15 standoff range is really not quite good enough to get in close enough to well-defended combat ships of the Soviet navy. Some ships are not so well defended and the GBU-15 could be effective. But it does not have a good standoff capability.

As you know, we are examining the various Tomahawk programs with the Navy to find the best way to kill Soviet ships. We need to reexamine the extent to which we can get standoff weapons on the B-52's and possibly other weapon systems—the B-52 is the first candidate—in such a way that those weapons will provide a rapid ship-killing capability which can be projected throughout the ocean.

Senator NUNN. So we are to assume that you and the Navy are in close correlation and you are coordinating your programs, and you see eye to eye in the use of the Navy and the Air Force?

General ALLEN. Yes, sir.

Senator NUNN. That is not in accordance with what I hear.

General ALLEN. I am still struggling with the right way to say that. First of all, there will be differences of opinion, obviously, on the best way to do these things.

NAVY SELF-SUFFICIENCY

No. 2, the Navy characteristically would like to have the organic capability to accomplish the war at sea without having to rely on sup-

port from assets that they are not sure they have control over. For example, in the case of AWACS, they are concerned that the NATO AWACS program, for example, which would provide the aircraft most easily assignable to the [deleted] will, in fact, not be assigned there because of the higher priorities of the Central Region. Therefore, we and the Navy do have to sit down and argue about whether or not we should budget additional E-3A's, and if so, how should they be controlled to assure the Navy of the appropriate threat protection in those areas.

Second, the Navy is concerned about any proposal we have with regard to the B-52's. They feel that if the National Command Authorities decide to generate the maximum nuclear force, the B-52's are very likely to be withdrawn from an antiship role. Therefore, they are concerned that after developing an antiship capability as a corollary role to the B-52s' nuclear capability, the Navy will end up not getting that assistance during the time that they most need it.

So we do have these kinds of issues to work out and go through. Obviously, there are differences of view of that.

I think the best assurance I can give you is that we are, both the Navy and the Air Force, very much seized with the problem. We are determined not to let inappropriate interservice arguments impede us in finding the right kinds of solutions.

Senator WARNER. General Allen, please continue.

General ALLEN. I think we agree that in some areas of the strategic balance the situation is not as good as it has been, that it is getting worse and that measures must be taken to correct that. I have no great concern over these differences in wording, and find reassurance that the country is coming to grips with these issues. It is more determined than it has been in the past to face the problem and start the changes that need to be made in order to rebuilt that balance to levels that will give us greater and longer term confidence.

IMPORTANCE OF TRIAD

Now let me say just a word or two, if I may, about the importance of the Triad.

We have had a Triad for a long time, a combination of well-hedged, mutually supporting and complementing capabilities to strike the Soviet Union with nuclear weapons. It is extremely important that we maintain that. It provides us assurance that no degradation in one leg of the Triad will dangerously affect the status of the United States. It complicates the Soviets' ability to come to grips with these issues.

We are seeing now the strength of the Triad, as there are weaknesses in some aspects of our capability, but those weaknesses are offset by the capability of other legs of the Triad. We see in the bomber force, unless we have the introduction of cruise missiles and face the issue of improving the capability now provided by the ICBM, a situation where the Soviets have built an enormous air defense system, one we are able to handle now, but one which is improving and one which we must continuously watch and continuously be prepared to develop appropriate counters to.

Therefore, with each of the legs of the Triad we concern ourselves

with the possibilities of either vulnerabilities or degradations, and we must maintain a well-hedged Triad to offset possible shortcomings.

MINUTEMAN

The time factors are long term. We are now looking at the better part of a decade to correct this vulnerability with the Minuteman. During that period of time we will rely on the other legs of the Triad. We will rely on the continuing capability of the Minuteman in a number of scenarios in order to provide adequate retaliatory capability. But we need to keep the Triad.

Now, the strengths of the ICBM's in the Triad are well known and are extremely important. Those include proven, secure and redundant C³—a relatively unique feature of land-based ICBM's. It insures an extremely timely response. These are the [deleted] forces that the United States launches against the Soviet Union in almost all scenarios. They have the highest alert rate of any system by far. They have very high reliability; and are characterized by low operating costs. We have been operating the Minuteman for all of these years independent of warning. Clearly, we have always had some capability to launch the ICBM's while they are under attack, and there are various scenarios in which that is reasonable to do. We will retain that capability in the future. It has been a very important capability which the Soviets must ponder in examining our present situation, but it is clearly not an appropriate design characteristic for ICBM's. It is not the way we should have a Triad force built, where a very important characteristic is independence from warning.

IMPROVING MINUTEMAN FORCE

Over the years we have examined any number of ways to improve the Minuteman force. We have looked at bigger missiles; we have looked at increasing the hardness of the silos; we have looked at very deep silos, tunneling out silos, silos on the backsides of hills. We have concluded, with the accuracy which we are certain the Soviets have in their systems and the numbers of weapons which they will be able to apply to the problem, that it is futile to attempt to build an invulnerable silo.

MOBILITY AND CONCEALMENT COMBINED

So we came to the conclusion very early that mobility or concealment were essential characteristics in achieving the needed survivability. We looked for that mobility in air mobile forms, in water mobile forms near the coast and in variants of the Trident system. We looked for it in canals and in the Great Lakes. We have attempted to get that mobility on trains, and actually operated trains for a while in testing of that concept. We looked at road mobile deployment, from garrison to continuous mobile. We have concluded, after arduous examination of each of these alternatives, that the best solution was found in some system which combined both mobility and concealment; that is, not a fully mobile system and not a system that relied entirely on permanent concealment, but a system which combined those two into an arrangement of multiple protective structures connected in

some manner to provide mobility. This system would insure that, regardless of when the Soviets choose to attack, the location of the missiles would be unknown to them.

Senator WARNER. For the record, when you use the "we" that refers to the Department of the Air Force?

General ALLEN. Yes, sir. I am referring to the Department of the Air Force, although I would think that these conclusions are no different from those reached by the Department of Defense.

Now, in looking at the mobile connected shelter system, we have examined a wide range of engineering options. We have looked at tunnels, where the roads were underground; we have looked at vertical structures; and we have looked at horizontal structures. We have tried to vary these things in various ways in an attempt to find a combination that fits the optimum of mobility, concealment, and economy with the least environmental impact.

Clearly, many of those factors can be varied and we could not argue that we have found the absolute optimum. The most recent variations have been described to you previously, and we will review the status of those changes again today.

HORIZONTAL SHELTERS FOR MISSILES

It is still evolving and it evolves to a better configuration. We, at the present time, are convinced that the horizontal shelter, as contrasted with vertical shelters of a year and a half ago, is preferable. That was a close call that hinged on some changes in cost, engineering complexity, and the mobility provided by the system.

We think, in final analysis, that a fairly close tradeoff between some additional cost and the additional mobility does provide significant advantages to the horizontal shelter approach.

We are much stronger in our support of the horizontal approach simply because we have now invested another solid year in the engineering development of that program, and it would be delaying to back off from that unless there were very strong reasons for doing that.

The simplifications which General Burke will describe to you in a few minutes have evolved within the last year and are, to me, very encouraging.

Now, I was somewhat distressed with some of the implications of the system which we seemed to introduce into the configuration somewhat of a year ago. We have worked hard, together with the Secretary of Defense's office, Dr. Zeiberg and others, in trying to keep the advantageous features which were intended in adding those complications and yet get the system very significantly simplified.

I think we have been successful in that. We have made major simplifications. Clearly, we will have to reexamine that system for the new administration.

We have been told to do that and Dr. Zeiberg will explain to you how that will take place.

LAND-BASED MULTIPLE STRUCTURES

The Air Force is prepared to do that objectively and completely and examine whatever range of options are to be looked at. It is my

own expectation that the examination of that range of options will include further examination of the present land-based multiple protective structure system of MX, and we will again find, I think, some significant changes which are still timely to incorporate in the development of the program, and which will permit additional simplification and additional confidence in the development program with which we have yet to go forward.

So this program will continue to evolve. I believe it will evolve in a favorable way.

We have been concerned, and the Air Force remains concerned, about the questions of environmental impact. We are concerned about the realities of the environmental impact.

Senator WARNER. General Allen, for purposes of the record, and I want to try to create this record so our colleagues can look at it, perhaps you should go through last year's scenario by which the Department of the Air Force recommended the vertical, but then the DOD came along and came to the Congress with the horizontal, just so we understand what took place last year.

General ALLEN. May I delay, and General Burke will cover that in the briefing that he will give? And there is a set of specific dates which are involved.

Senator WARNER. Yes.

General ALLEN. All right. I believe that it was a little bit more than a year ago we were discussing the vertical; it was about a year ago, as I recall, that we discussed the somewhat more complex version of the horizontal basing, and it was within the last 6 months, roughly, that we have found the simplifications that we have talked about.

General Burke will describe that in some detail.

ENVIRONMENTAL IMPACT OF STRUCTURES

With regard to the environmental impact, the Air Force is very concerned about the substance of this issue; that is, that the system be deployed in such a manner as to cause the least environmental impact possible to the citizens of the area.

The approach that we favor, of course, has a number of advantages in that it uses Government land in areas with a very small population and very low density of agricultural and other developments. So it is better to have a number of alternatives that we have examined for use of the land.

Within the deployment methods that we have, we have looked very carefully and continue to look carefully at techniques which will minimize the environmental impact. I think that we are making a great deal of progress and that this system can be deployed in a manner which is environmentally acceptable by a reasonable person's standards.

Now, the second aspect which is of great concern to the Air Force is the procedural aspects of the environment question—to what extent we will be involved in lawsuits and to what extent we are vulnerable to significant delays caused by the Environmental Protection Act.

We have been rigorously following the laws. We are convinced that so far we are going to be able to continue doing that. There are questions that relate to the future which I am not fully competent to an-

swer, but I have increased confidence that we will be able to handle these matters. However, it certainly may be necessary at some point, if lawsuits associated with the Environmental Act entangle the process so completely that it gets difficult to meet schedules, that we will need to ask Congress for assistance in dealing with those issues.

We are determined and able to address the substance of the issue but the complexities of the legal procedures may require your assistance.

Now I would like to conclude by restating as strongly as I know how that it is my conviction, the conviction of the Air Force, and the conviction of the Joint Chiefs of Staff, that the United States must continue to have a survivable land-based ICBM of the general characteristics that have protected this Nation over some decades now. To do that we must proceed with a program which has survivable basing, and we must proceed as expeditiously as possible.

STATEMENT OF DR. SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS)

Dr. ZEIBERG. I have some brief remarks to describe to you the activities currently underway to review the program and to illuminate the various technical and policy issues that led to the choice of the current basing mode. That is the primary motivation of our activities. We are doing this with the agreed to and accepted understanding that we need a missile that has the sort of capability the MX has, that is of proper size and throw weight, with high accuracy and very flexible operating modes.

Senator WARNER. The missile design is fixed, the parameters are fixed?

Dr. ZEIBERG. Yes, and we have fired two of the four stages successfully in recent times. We will fire the other two within a matter of weeks.

The guidance system is well tested and, in fact, was flight-tested a few years ago on a Minuteman piggyback mission.

The warheads are developed. They are the ones currently being employed on Minuteman. We have high confidence that the missile will meet the schedule and meet its performance objectives.

Senator WARNER. So your review with respect to the missile is minimal?

Dr. ZEIBERG. It is minimal.

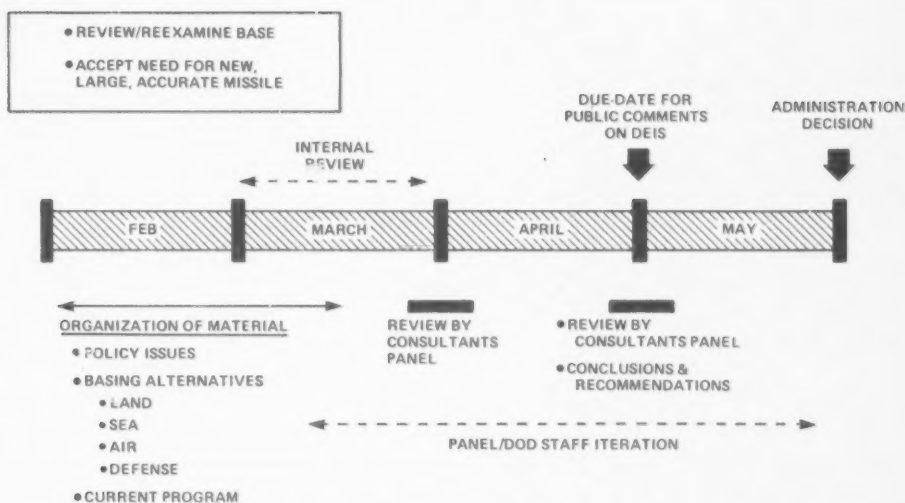
MX BASING MODES

In connection with basing modes, if there is a modification in one degree or another, we will look at that. That has been studied considerably in the past. These are not new thoughts that we are pursuing right now; in fact, some of the basing modes which have been discussed openly don't allow a large enough missile to satisfy our objectives. That indeed is a reason to reject some of those modes.

I have a couple of charts that will help explain what we are up to, if I may have the first chart

MX BASING REVIEW

—DRAFT PLAN—



We hope ultimately to put the administration at the decisionmaking point about June 1. The process is based to some degree on receipt of all of the public comments on the DEIS.

PUBLIC'S COMMENTS ON THE DEIS

This area may be one of the principal areas of concern to the administration. I know Secretary Weinberger is concerned that performing a review without full input from the public by their reaction to the DEIS, and the interrelation with the public on questions of impact mitigation, would not be a fair thing to do, nor an objective thing to do.

So our pace is really selected by this date, and that is roughly May 1. We are assuming that we will need a month of internal discussions and then discussions with Members of Congress.

The ultimate review will be done by a panel of distinguished consultants. I am not at liberty today to name the people whose effort we will solicit. The Secretary is pursuing that personally, and will soon be in a position to tell you who they are and exactly what their charter will be.

In preparation for that review, we now have a large team involving the Air Force, the Army, and the Navy for their respective technical input to basing modes, plus the OSD team contributing their various skills. We are all working together to prepare an organized set of material that will illuminate the various policy issues underlying the project, and the various features of the basing modes that have been examined.

What we will do is examine and lay out in some detail with the Secretary all of the serious alternatives that were contenders. We are not taking all of the things that came off the wall, and many things do on

this subject. There are about eight or nine that were serious enough contenders to warrant reexamination.

We will also look at the features of the current program as described by General Allen, to see if there are simplifications or improvements that upgrade the technical performance as well as provide some indirect way of mitigating the system's impact on the public.

We will do a brief assessment of where we might stumble, in the sense of impact mitigation and interaction with the public, so we will get a feel for whether or not we have to seek additional help in expediting some of the mechanical processes associated with system construction.

Some of this is already organized and as basing modes are evaluated we will review the material and prepare for the review by the outside people. We hope they will all be signed up in 2 or 3 weeks so we can solicit their input and evaluate specific points that they would like to see addressed.

Then we will have what I envision as two lengthy sessions, perhaps on the order of a week, where we all get together and work out the review and the subsequent development. A staff involving OSD and the military services will be available to the panel to provide information and a lot of question and answer back and forth during that activity.

Senator WARNER. I have two questions: First, Congress has to work in parallel in some respects here, and it is the intention of Chairman Tower to have our authorization bill completed in late March or early April; therefore, there is a problem within this committee as to how to handle this very essential program. Do you have any suggestions on that, Dr. Zeiberg?

Dr. ZEIBERG. I think we can give you an interim report after we get a first pass with the panel. Issues that will be black and white will be apparent by here (indicating).

Senator WARNER. The second question is, to what extent does the Secretary of Defense intend to share with Members of Congress and particularly with this committee, the findings in that first group, which is called Organization of Material and the Deliberations of Consultants? Will we at some point in time, in late April or May, be presented with a large collection of this material? In other words, how are we to receive the results of these deliberations so we can conduct our work, and how and when are we going to get it, in May, or as you go along?

Dr. ZEIBERG. I will outline what we will look at. Many of these ideas are familiar to you and other Members of Congress.

This issues that we will raise with the consultants will be organized in this time period. As we convene the group, there will be a set of questions. Those can be made available to you as soon as they are generated. I believe it is the Secretary's intention to simultaneously announce the program, and that is coming up very shortly.

I believe that the most productive point would be after the first pass by the panel. A lot of this will be for background purposes. There will be many people on the panel not as close to this program as the Congress has been and is right now, so there will be a fair amount of material here. I don't think this body of material is particularly useful to you, but the results of this review process will be.

Here we will know whether or not there will be any major changes, and we will have a good fix on implications for the budget.

I might add, by the way, that about 60 percent of the program is dedicated to the missile, and about 40 percent to the basing mode. The budget is dominated by the desire to continue with the missile.

Senator WARNER. Assuming the executive branch and the legislative branch are seeking a common goal here, to what extent is the legislative branch permitted to observe the work of the review consultants in their deliberations?

Dr. ZEIBERG. I will convey that request to the Secretary, to have congressional interaction with the panel.

Senator WARNER. Are you prepared to say there will be no delay of the IOC as a consequence of this deliberative process and further study?

MAJOR CHANGES WOULD DELAY PROGRAM

Dr. ZEIBERG. No; I think if we make any significant changes in the program there would be a delay, and that is obviously a very serious issue for us to consider in this review process. For example, even changing from horizontal to vertical shelters, the point General Allen mentioned a few moments ago, would delay the program by close to a year. We have invested a year in detailed engineering and development testing of the launcher for the horizontal shelter.

Senator WARNER. If you switch to vertical, what happens?

Dr. ZEIBERG. We have to review that work.

Senator WARNER. That would result in a delay of a year in the present IOC?

Dr. ZEIBERG. Yes, certainly. If we adopted another basing mode, if we went to a surface ship or something else, it is like starting almost from zero.

Senator WARNER. I will rephrase the question: The study will not delay the IOC as projected by the Carter administration; however, if they study results in a different conclusion which is expected by the Secretary of Defense, in terms of the Congress, then we would have a change in IOC?

Dr. ZEIBERG. Yes. The program is proceeding full speed ahead while this is going on. There is parallel work here.

This is somewhat of a consensus. It is a chart called Basing Concepts. This list of concepts is a consensus of the people working on the problem and includes the ideas that are worth resurfacing and presenting to the administration, serious contenders from the past. It includes the various configurations of the multiple protective structures idea, with and without defense adjuncts. It includes the road mobile system which is either dispersed fully on the Interstate Highway System in peacetime, always on alert, or a concept that is dispersed upon strategic warning in times of crisis.

BASING CONCEPTS

● LAND BASED

● MPS

- MX IN UTAH/NEVADA, TEXAS/NEW MEXICO
- MM OR NEW MISSILE IN EXISTING MM BASES
- WITH BMD ADJUNCT

● ROAD MOBILE

- DISPERSED IN PEACETIME
- DISPERSED ON STRATEGIC WARNING

● AIR MOBILE

● SEA BASED

● ACCELERATE CURRENT PROGRAM

- TRIDENT SUB & D-5 MISSILE

● SUM

● SURFACE SHIP

- LAUNCH FROM SHIP
- LAUNCH FROM FLOTATION GEAR ("HYDRA")

● DEFENSE

- FULL DEFENSE OF EXISTING MM BASES
- DEFENSE OF LAUNCH-UNDER-ATTACK CAPABILITY
- NON-NUCLEAR

SEA-BASED IDEAS

We will put the air mobile concept in context. We will look at three sea-based ideas, one simply being an acceleration of the current Trident program, and the D-5 missile, that being the surrogate for the MX missile in the sense of a new, much more capable missile.

I might point out in passing here—and I will go into this in more detail in a later hearing—that we don't really have the freedom to accelerate the Trident submarine construction. It won't be until 1985 that we could build two a year, and we are not quite building one a year yet.

SUM SYSTEM

We will look at the SUM system, the small submarine that carries two or four missiles externally. That has received a good deal of attention and is now the subject of an Office of Technology Assessment study.

We will look at the surface ship idea again. That is something that dates back to the early days of the strategic nuclear force development. You may recall that the early Polaris and Jupiter developments were originally scheduled for surface ship deployment. When Admiral Rickover broke through and came up with the nuclear submarines, we went to submarines because they were far more survivable. In that idea, one could launch directly from the ship or drop the missile and flotation gear overboard and launch from the flotation gear.

We will look at the possibility of defense. There are some major developments of the last few years that make defense look more attractive.

We will look at defending Minuteman bases and, as I noted earlier, defending the MPS idea. We will also look at the coupling of defense with launch under attack. There are ways, with an equivalent ability, to defend your force under attack that provide a threshold for some of the operations which are normally in too delicate a balance to rely on. That might be done by a nonnuclear defense. We will go into those in some detail in a later hearing on the defense program.

In company with this, there are some policy issues that need to be laid out once again, in particular the question of maintaining independent survivability modes for different elements of our strategic forces. The Triad concept will be laid out and the significance and consequences of depending upon systems whose survivability depend on warning will be surfaced again.

You will recall that in the past, many of those considerations provided very effective filters for the technical ideas developed. I suspect they will do so again.

PUBLIC RELATIONS PROBLEM

Senator WARNER. We have a very significant public relations problem here, not only with respect to the American public but also certainly the Western alliance and many others.

While I support the President and the Secretary of Defense in going back for this reexamination, I hope we can manage this public relations problem in such a way that it doesn't appear that we just can't make up our minds.

This is going to be a very major, costly program. For those of us on this committee and others in the Senate who support it, to the extent we can show a common purpose and a unity between the executive branch and the legislature, the greater will be our success in getting this through the Senate and eventually through the Congress with minimal criticism.

Senator GOLDWATER. I am wondering if they have with them a chart that will show the two States in question, and exactly where they are thinking of putting it? Is that coming along?

General ALLEN. Yes.

Senator WARNER. General Burke, will you now take us through the chronology from day 1 to where we are today? I know no one better qualified to do that.

**STATEMENT OF LT. GEN. KELLY H. BURKE, USAF, DEPUTY CHIEF
OF STAFF, RESEARCH, DEVELOPMENT, AND ACQUISITION**

General BURKE. Thank you very much, Senator.

I was asked, in coordination with the staff, to talk about the whole question of the land-based deterrent force today and that, of course, includes the existing Minuteman, as well as the MX.

I am aware the concern today is primarily on the MX, and we will put that on first, and get to the modest improvements we are planning for the Minuteman and Titan at the end.

SURVIVABLE LAND-BASED ICBM

I think I might begin by elaborating on a few points that General Allen has already made, and that is, in attempting to provide a survivable land-based ICBM, which is the recommendation not only of the Air Force but also of the Joint Chiefs of Staff as well. It is not just the form of the ICBM that we are trying to preserve; it is a system that has certain characteristics that has caused this country to value it for a long period of time, that apparently caused the Soviets to value ICBM's even more, judging by the distribution of their forces.

Among those characteristics were, until the Soviets began to employ this very large number of highly accurate missiles, a very high degree of survivability in those hardened silos where they now sit. As General Allen said, very importantly, that survivability was assured without reliance on any type of warning, either strategic or tactical. By contrast without some kind of strategic warning we would expect to lose our nonalert bombers and nonalert submarines. Without tactical warning, as well, we could fear the loss of even our alert bombers. Further, those missiles and their silos, when they were survivable, survived in a manner that left them to be used over a period of time.

If one could imagine an extended conflict, not only were they there because of that command/control, they were there in a manner to let the President either use them if he elected or withhold their use, with the assurance that he could use them later at a time and place of his choosing.

FLEXIBILITY AND COST FACTOR ASSET

Additionally, they are the most flexible forces or, as some would say, have the greatest war-fighting capability, very quick reacting, in 30 minutes flight time for an ICBM from the United States to the Soviet Union, or vice versa, relatively large-yield warheads and a high degree of accuracy that would let you put them against any kind of targets. I think cost is not an insignificant characteristic if one imagines that we really are not going to execute this general nuclear war with the Soviet Union and we all pray that is the case, but we really do expect we will be in that strategic competition with them for decades, and we need to think very carefully about doing the things that are easiest and relatively inexpensive to do, and ICBM's operate for less than half of what a bomber or submarine does.

But by far the most important characteristic, in my mind, has always been the fact that we are not subject to the same attack mode as the other legs of the Triad. Bombers and submarines at their home-ports can be attacked by relatively inaccurate weapons, and the ICBM's in their silos can be successfully attacked only by the highly accurate ICBM's of the Soviet Union. ICBM's obviously are not threatened by improvements in air defense systems or antisubmarine warfare and that type of thing. We have always taken a great deal of comfort from the belief that if there is a technological breakthrough that comes along and threatens one leg of the Triad, because the other legs are dissimilar that threat probably would not pertain to the other two, and we would count on those two healthy legs to tide us over while we fixed the one that was sick.

That is exactly what happened. The Soviets have developed ICBM reentry vehicles of greater accuracy than anyone I know would have predicted even 10 years ago, and they have elected to deploy them by the thousands.

So, the land-based ICBM leg is not healthy. That is a major asymmetry and a dangerous one. It seems to me that our first priority should be to fix that problem while we still have high confidence in the survivability of the other legs of the Triad.

OUTLINE

PROGRAM OVERVIEW

CURRENT DESIGN

PROGRAM STATUS

CRITICAL PATH TO IOC

EIS PROCESS

LAND WITHDRAWAL/ACQUISITION

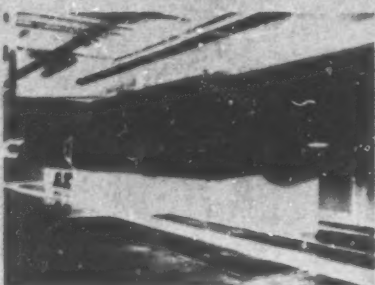
SPLIT BASING

COST

RESPONSE TO INCREASED THREATS

Turning to the MX system itself, I would like to follow this outline again in consultation with your staff, Mr. Chairman. It is rather a broad range of subjects, all of which I believe are of interest to you.

M-X



- DSARC I COMPLETED 9 MAR 76
- VALIDATION PHASE INITIATED 1 OCT 76
- DSARC II COMPLETED 21 JUL 79
- FULL-SCALE ENGINEERING DEVELOPMENT INITIATED 7 SEP 79
- MISSILE FIRST FLIGHT EARLY 83
- DSARC III JUL 83
- IOC JUL 86/FOC DEC 89

Let me use this general outline of where we have been and where we are going as a vehicle to address your question of the history of the decisionmaking process.

DSARC

You are familiar, sir, with the term "DSARC." That is a council, a vehicle, by which the Department of Defense makes major milestone decisions on its weapon system acquisition programs.

The DSARC I is the authorization to go into early stages of development, during which you validate the concept that you are working on. That took place back in 1976; and following that there was a considerable amount of technological, scientific review, discussion, and a fair amount of engineering work. But I would like to point out that even at that early stage there was solid agreement within the military and technical community that the right answer was some form of what we call the MPS, multiple protective shelter.

If you are looking for a basing mode to provide survivability, you can consider a silo defense with an ICBM. They didn't think at that time that was technically feasible in the time frame required. You can look at impervious silos, more concrete, or putting them in south slopes of mountains, and no one was ever able to develop confidence we could do that. You can try to keep them in constant motion; that is, put them out on the highways or on the rivers of the country where they are in a constant state of motion; and it was generally agreed that that presented some insuperable problems in terms of public interface and problems of both security and safety.

That leaves one final family of alternatives which I call multiple protective shelters, which has the notion that the way you solve your problem is that you hide the relatively small number of missiles in a relatively large number of shelters. Since you don't think you can keep things hidden forever, you wind up with some system to connect those shelters, so you can move between the two.

Since you don't want to have more than one shelter threatened by a single attacking warhead, you always provide some degree of hardness so that he would have to contemplate an attack on each individual shelter.

All of those are within the family of what I call multiple protective shelters, MPS.

MPS-MULTIPLE PROTECTIVE SHELTERS

There are some vertical and some horizontal and have underground connecting railroads and above-ground connecting roads, and some of those roads and rails are ordinary, but the logic is the same. You are going to have a small number of missiles in a large number of shelters and provide some means for moving missiles from one to the other.

Basically, we were doing the engineering evaluation in those days searching for what was the most cost effective way to actually provide for that concept. We began by looking at trenches and found that trenches would work, but we worried a great deal, or nuclear physicists worried, about the effect of nuclear exposure in those trenches and how it might propagate; and the more we studied it, the more it looked like it was going to be too costly.

We moved from that into looking at discrete shelters, both vertical and horizontal, and for a period of time our focus was on the vertical shelter. The earliest estimates were that you could build vertical shelters quite cheaply, and the more we studied that, the more we found out that the cost was not as cheap as first we thought or believed. But still as of the time we went to our second DSARC, which actually started in December 1978, the generally preferred solution was that of vertical shelters, or a vertical MPS. The distinction between vertical and horizontal MPS is primarily in the degree of mobility which is associated with the horizontal. It is easier and quick to move a missile when it is stored horizontally. It takes hours to take a missile from the vertical position and extract it from the silo and translate it to horizontal and translate it back and engineers have not been able to devise a quick way to do that.

If it is stored horizontally the first place, you can slide it into the dock in a matter of minutes. So the vertical system requires high confidence that you can preserve the location uncertainty for concealment of the system, because that is the inherent means of survivability.

We actually began the second DSARC, the one that provides for development, in December of 1978. We proposed the vertical MPS system at that time. President Carter and several of his senior advisers expressed a great deal of reservation about the whole concept of survivability of land-based missiles and directed some additional studies. That DSARC action didn't get completed for over 6 months, and during that period of time we went back and studied another

version of air mobile and we studied another version of road mobile, and found that they did not tend to preserve the characteristics that we desired in the ICBM. They were set aside.

In the summer of 1979, President Carter did approve the full-scale engineering development of the MX missile, and he approved the development of the larger of the two that were under consideration. We were looking at a 92-inch diameter size missile, and he said at that time that he wanted some form of deployment that would provide more mobility than was in the vertical system. He asked a question, not unreasonably, and he said, even though none of us can see any way that this concealment will be compromised in the future, and no one can imagine how it would happen, how can we guarantee that in the year 2010, when this system will be still operational, something won't come along, some technology, that will compromise that concealment?

The answer to that has to be that we can't guarantee it and in that case he said, "I am willing to pay a premium on the order of 10 percent to put in a horizontal mode where, in addition to concealment I will also be able to move it rather rapidly."

HORIZONTAL DASH

Out of that came a system that at the time was called "Horizontal Dash," and it was approved by the National Security Council and the President. It was still an MPS system, quite clearly, but also a system that incorporated as much directed mobility as could be manageable.

RECENT REFINEMENTS

ELIMINATED SHELTER-TO-SHELTER AUTOMATED DASH

CHANGED FROM DRIVE-IN SHELTER TO LOADING DOCK

SIMPLIFIED TRANSPORTER

ELIMINATED SHIELD VEHICLE

ELIMINATED ONE SET OF BARRIERS

CHANGED FROM "RACETRACK" TO LINEAR ROADS

ELIMINATED SPECIAL RAILROAD

It would like to move from that point to this, because we have made some modifications from that time.

At the time of 1979 when the President selected this design, there was a great deal of focus on this dash capability, and in the opinion of the Air Force it had become more complex and more cumbersome than it needed, because too much attention had been focused on that particular design and goal.

At the same time, we didn't see any fatal flaws in the system and we were content to accept the President's decision to move in a full-scale engineering design with that system, with the thought that we had over 3 years of continued R. & D. in which we could refine it and improve it.

We thought it was a fundamentally sound proposition; and indeed, a number of changes have been made to improve the system as it was approved by President Carter in September of 1979.

The ultimate in Dash is the ability to dash from one shelter to another shelter in a few minutes in an unmanned or automated configuration. That was designed into the system as it was first proposed. The more that was studied, the more it was questioned if that was really practical, because it added a great deal of cost.

After a Defense Science Board review, that feature was abandoned and when we did that it let us change from a much larger shelter in which you had to house the entire vehicle, to a smaller shelter in which you now only house the canister launcher. That permitted us to build a sturdier and cheaper shelter and simplify the transporter.

In order to have that total vehicle that you were hiding, you also had to have a separate shielding so when you moved it from shelter to shelter it was not apparent that the vehicle with the missile in it was under that shelter. We eliminated that. We also did away with some barriers that were sort of routinely added for SALT verification purposes. We also got away from the racetrack. That was to facilitate that dash, and straight line roads make more efficient use of the land than does the racetrack. So we changed that, and finally we convinced ourselves we did not need a special and unique railroad to move these missiles from their assembly area to the deployment area.

POTENTIAL REFINEMENTS

ELIMINATE SALT PORTS

ELIMINATE SINGLE MISSILE CLUSTERING

VALLEY CLUSTERING

REDUCE TRANSPORTERS

The next is potential refinements. We think the design as it now is is almost right, but as General Allen said, that is the purpose of having a full-scale engineering program, to seek opportunities to refine and improve up to the time you go into production. We think that there are some very likely candidates for additional refinement, that would reduce cost and make this a less complex system.

SALT VERIFICATION

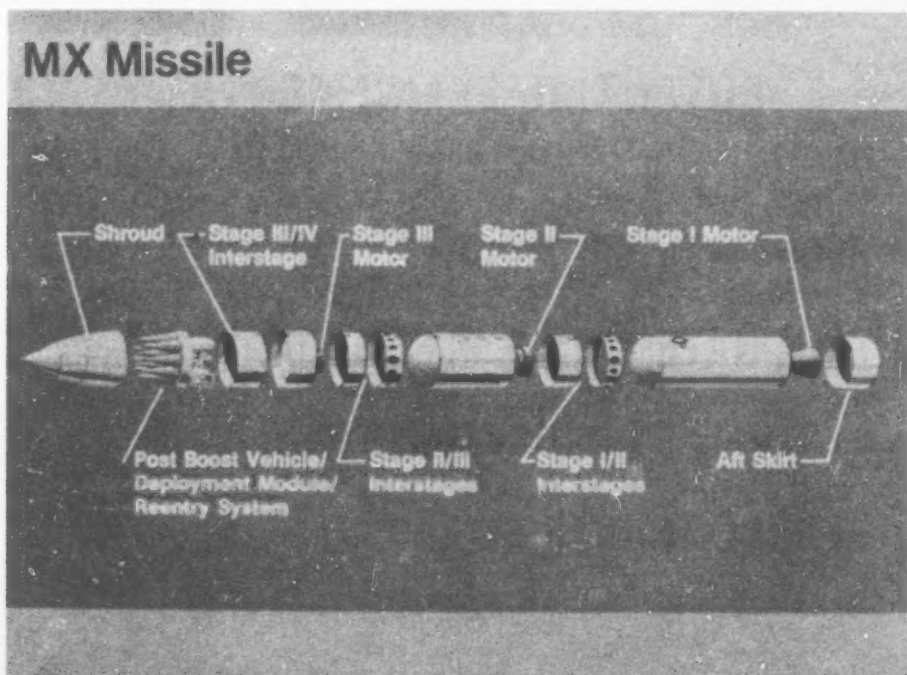
In addition to the conversion from vertical to horizontal, President Carter and his advisers also added some additional SALT verification enhancement features to the system.

The basic system has rather an elaborate scheme of verification, by national technical means, or satellites, under SALT or without SALT, and that followed the analogy of submarines, and that is, we would build these missiles in a designated assembly area where they would be counted, and we would then introduce them into the deployment area. Once there they would disappear, just as submarines would disappear when they go to sea. To that was added openable ports in the top of each of the shelters, the idea being that somehow, in some circumstances, you might wish to open some number of these and inventory them, but there never was a theory of how and when you did that sampling.

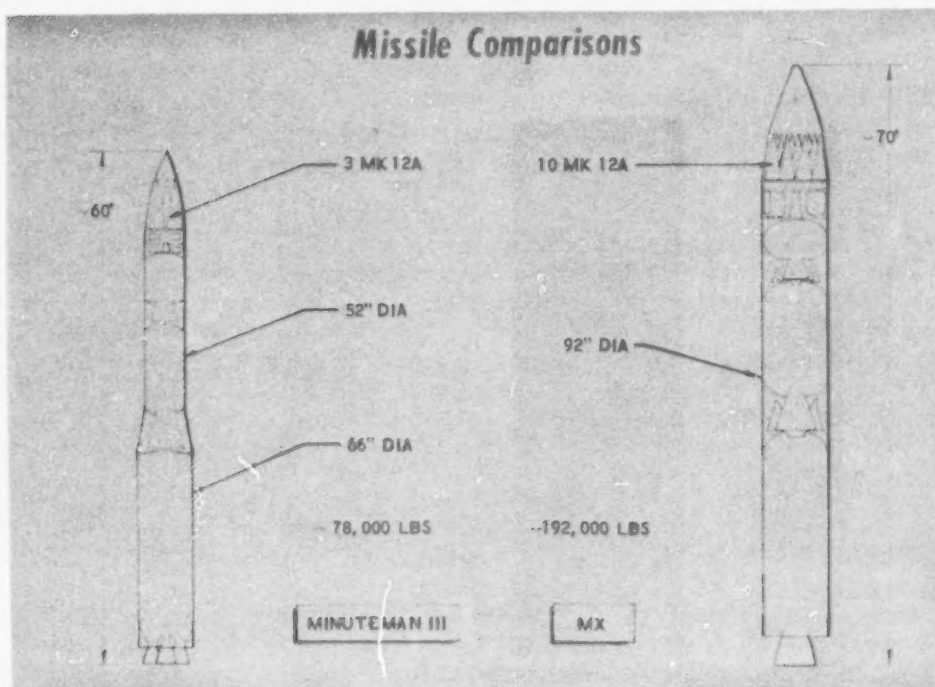
So all of that needs to be looked at, along with another feature that was part of that scheme, and that was to confine each missile in a single cluster of 23 shelters. It would be cheaper and more efficient. For example, you could put 10 missiles in 230 shelters in a valley so the missiles meander from any shelter to any other shelter and not confine one missile to a specific set of shelters. That also lets you reduce the number of transporters required if you confine it to a single cluster.

So all of that is under review, and I think that offers further opportunity for improvement. But as to the design, as it stands now, with those past refinements but not with any of the potential refinements.

MX Missile



This is the missile itself. It is a four-stage missile. It has three solid rocket motor stages, and the fourth stage is what is called the post-boost vehicle, which actually deploys the reentry vehicles.

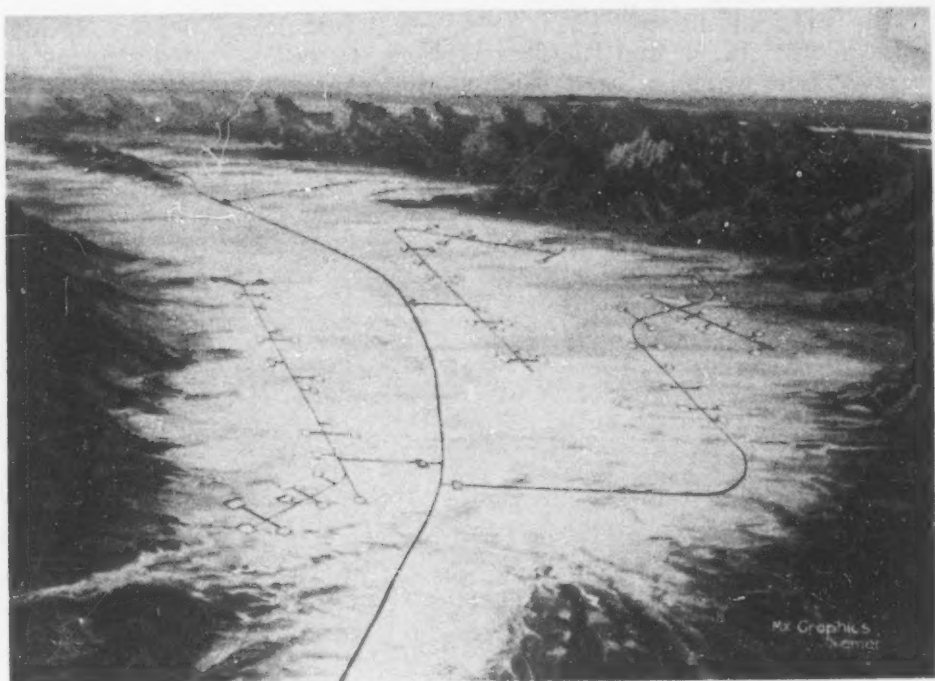


There is not really much advance in the technology in the MX, but at the same time it takes advantage of just the general progress of knowledge in rocketry and the missile field; it has been 15 or 20 years since we built the Minuteman and the aggregate of those incremental improvements is that the MX is quite a bit more efficient; it weighs about $2\frac{1}{2}$ times as much as a Minuteman, and although we have a baseline of 10 MK-12A warheads, it actually can carry 12, so it is $2\frac{1}{2}$ times the weight, and it carries 4 times the payload of the Minuteman.

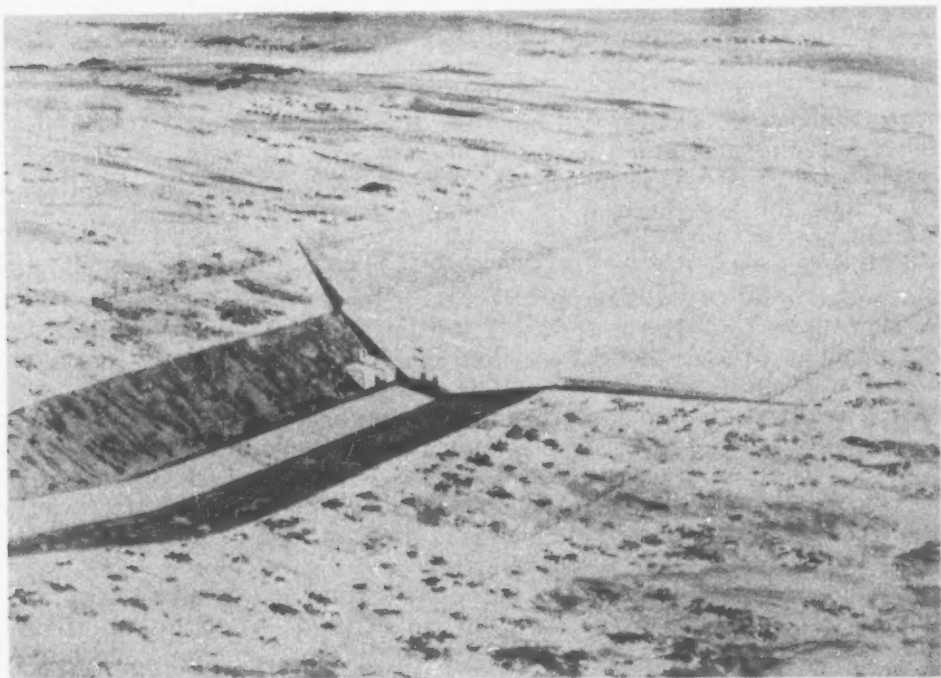
This is the basic design [indicating], and I have touched a little on the background of multiple protective shelters or MPS and the general concept.

This is an artist's picture of what that design might look like deployed in perhaps a valley in Utah, in one of the alluvial valleys. They have a main road that runs through the valley; that is a dirt road, compacted dirt and not paved, and then there are spurs that lead off into each of these clusters. Here you see what is called a berm, or barrier. That is, again, a SALT or verification feature, and after you put the missile in there, you just pile dirt up and a satellite could easily tell if that dirt was disturbed later.

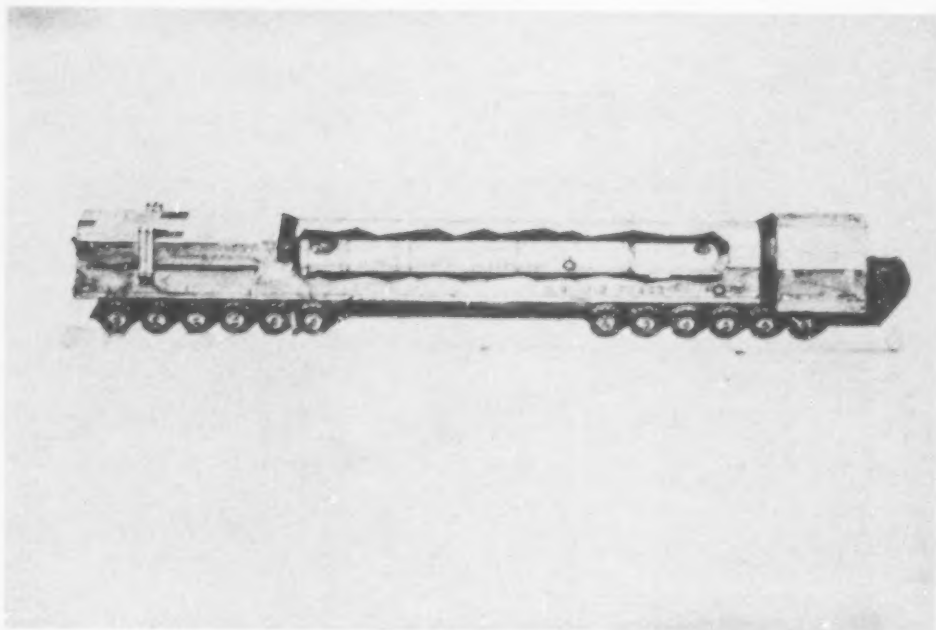
There are 23 shelters shown here, each of which is about a mile apart, and room has been left and space has been left to add another 12 in there. If the threat were larger than we expected, we could add 12 shelters and bring that up to 35. That would equate to about 7,000, as opposed to our base line of 4,600.



One of the improvements we are talking about is that we would put that barrier here [indicating] and remove it here, and then missiles could move from this cluster to this cluster, or any other cluster in that valley, and that would effect some saving.

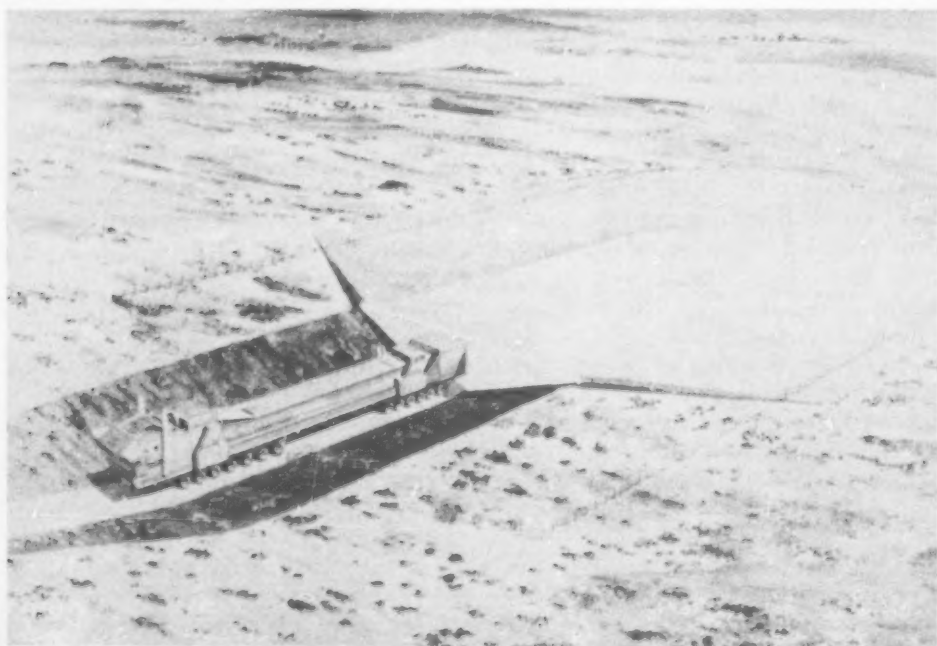


That is about the way an individual shelter would look, and perhaps you can make out the round door there. That is about 10 feet above the floor; around it you see a fence and it is nothing more than a stock fence. Inside that fence is about 2.5 acres and that, and only that, is the land that would be excluded from public use and for multi-purpose use, as is now the case in that area.

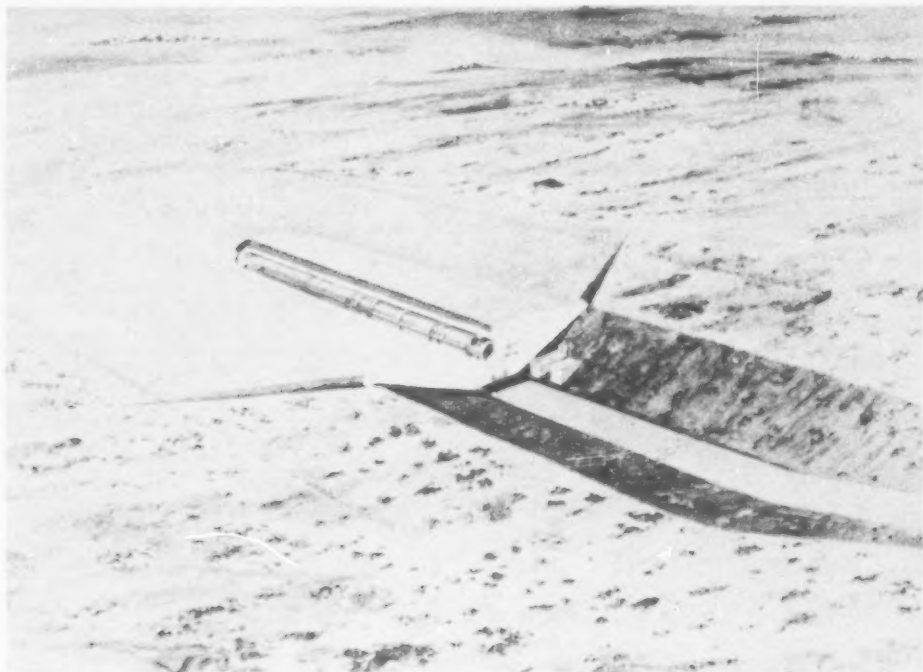


MISSILE MOVING VEHICLE

The vehicle that could carry this is very large; it weighs about one million pounds and the missile launcher adds about half a million pounds to that.



It has 12 axles, and when moving a missile or pretending to move a missile, it backs up to the shelter and has this sliding door here [indicating] which goes flush against the shelter; that round door opens inside that shield, so that it is never visible to an observer even if the door is open. There is nothing to be seen except that the vehicle is there.



Once inside the shelter, that would be the missile in its cannister and that is about 155 feet long. All that would be visible would be the smooth top of the shelter.

SIMULATORS/DECOYS

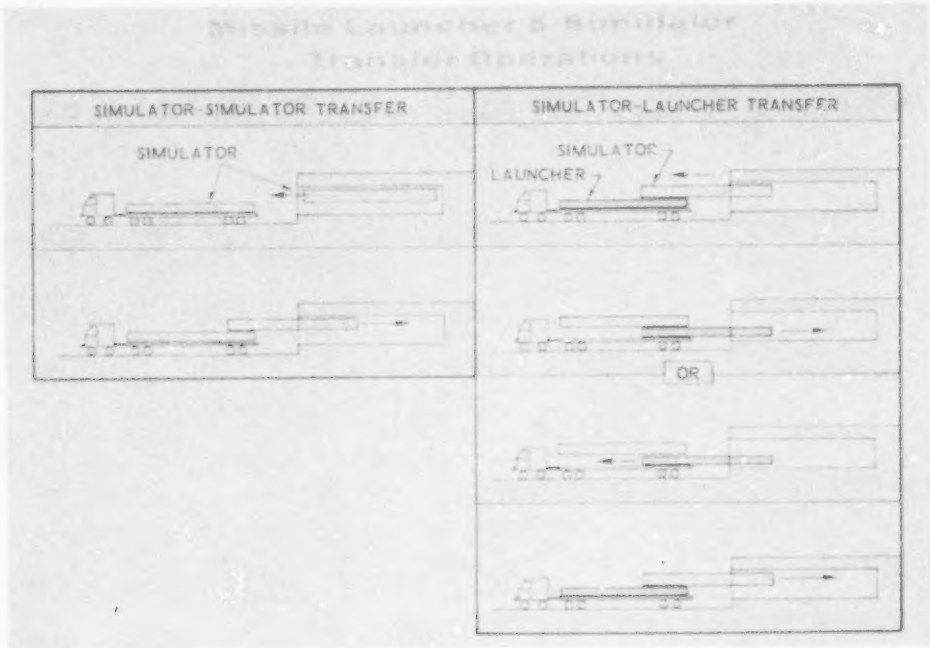
We have a very extensive program to give us high confidence that we are successfully concealing these missiles. To do that, we are planning to have what we call a simulator, as well as a missile. People sometimes call simulators decoys, but simulators are not a decoy as we normally think of decoys, for example as duck decoys.

If you can imagine a long concrete and steel pipe, say 155 feet long, and about 14 feet in diameter, and if you would cut it in two, you now have two simulators, so it is an arch. It fills the space of the shelter. We would build a cluster of 23 shelters and we would have one missile for that cluster, and we would have 23 simulators with it.

The idea is that the truck that is moving it would always weigh the same and the [deleted] signatures would always be the same, regardless of whether you had a missile on it or a simulator on it.

The idea is, you would not move these missiles very often. Normally, you would move them only when you had performed maintenance on

them, and thereby exposed in what shelter they would be, and that would be about once every 4 months for each missile. If you had 200 missiles, you would be moving one of the 200 every day.

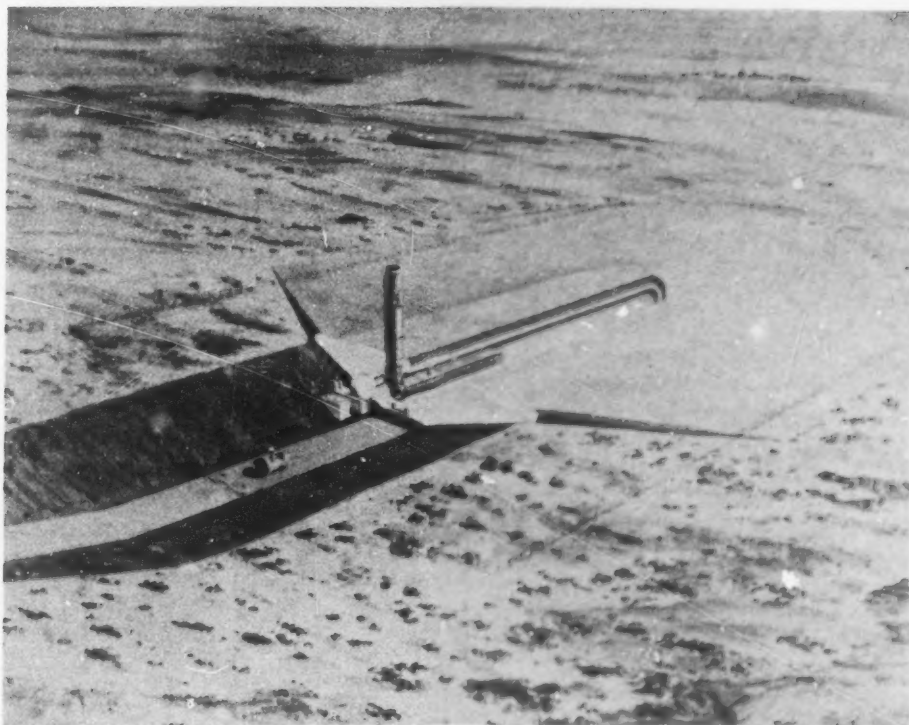


The idea is that you would take that missile, once you find it necessary to move it, and you would put it in one of the 23 shelters, but you would make fake implacements of the others, so the truck would go to all 23 shelters and in one would leave the missile and in the others it would do all of the visible things exactly the same way, so that to an observer there would be no possibility of discerning in which shelter the missile was located.

That is done by having the simulator in the process and in 22 of these he would simply swap one simulator for another, and in another, he would swap the missile for the simulator.

The truck can actually take two simulators at one time, or a simulator and a missile. In this case, he brings in one simulator and puts it right back; but the springs are compressed and all of the signatures are just the same. Here, in this case, he is putting the launcher in, and after he takes out the simulator he puts the launcher in. That is just the opposite of that where he is taking the missile out and replacing it with a simulator.

So, the signatures are always the same. Should it be necessary to launch those missiles, that is the way it would take place. It partially extends. Remember, it is 10 feet above the floor, so if there is debris after an attack, it would come over here. There is a blast plug that comes first and falls out. The missile launcher translates to the vertical position and uses a cold launch system.



Just like it is shown here, it would expel that to about 100 or 110 feet past the tube and the rocket would fire and the missile would be on its way.

M-X ACTIVITY LOCATIONS



To look at the current status of the program, there are a large number of contracts. Unlike most of our airplane programs, the Air Force acts as its own general contractor for a major missile system, so all of these are subordinate to our Ballistic Missile Office at Norton Air Force Base in California, with the work spread over a great deal of the country, as you can see.

The first stage has been recently test fired in Utah by Thiokol.

The second stage has not yet been test fired but will have a first firing in April, and the third stage is made by Hercules, and that has had a recent successful test.

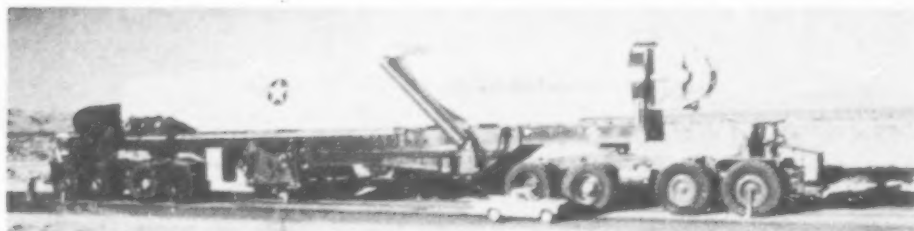
ADVANCED INERTIAL REFERENCE SPHERE

The most impressive technological advance in this system is its guidance system, which is called the advanced inertial reference sphere. That is a floating ball suspended in a fluid, less than a foot in diameter, and it produces really remarkable accuracy. We could deliver the MX warhead with a miss distance of only on the order of [deleted].

Senator WARNER. That has no classification?

General BURKE. Yes; the miss distance [deleted].

Senator WARNER. But a picture of this is in the open?



General BURKE. Yes. We have also developed and been testing a vehicle somewhat different than the one we would propose to build, but of the same weight and general size, and we have been operating this in Nevada at the Department of Energy test site on unpaved roads, including in the rain that they had out there several months ago, and it has worked quite well. It is confirmed that you can operate vehicles of that size and weight.

The only problem we had was that we bought off-the-shelf cleated tires and they don't work well on unpaved roads, so we have to go to a smoother tire.



VANDENBERG AIR FORCE BASE TEST SITE

Construction is well underway at Vandenberg Air Force Base where we will be doing our initial launches and testing, and this is the missile assembly building under construction.

That is a financial breakout for both 1981 and 1982, for research and development, with the moneys allocated in the program as you see there.

I would like to comment just on two of them. There is an Air Force Test/Evaluation Center in Albuquerque, N. Mex., and we have assigned them a major role in making sure that we do successfully conceal this missile.

Basically, General Allen has asked them to become a team, to put on the hats of Soviet planners and espionage agents, to contract for the best scientific minds the country can produce, and set out to deliberately see if they can't find some way to find out where one of those missiles is located.

We think that we can give them advantages and opportunities that the Soviet counterparts could never have, and we would think that if we keep that team out there actively and aggressively—again borrowing a page from the Navy's book in which it protects its SLBM's—any deficiencies would come to our attention before the Russians could possibly find them.

M-X FSED EXPENDITURES
(\$ MILLION, THEN YEAR)

PROGRAM COMPONENT	FY 81	FY 82
PROPULSION	\$315.6	\$411.1
GUIDANCE & CONTROL	260.5	400.4
REENTRY SYSTEM	67.0	93.2
MECHANICAL SYSTEMS	297.9	464.4
ELECTRICAL SYSTEMS	103.2	263.1
PERFORMANCE & SOFTWARE	31.8	65.3
CIVIL ENGINEERING	67.4	77.4
SYSTEMS TEST	133.1	251.7
VULNERABILITY AND HARDNESS	23.0	68.9
DEPLOYMENT AND HARDNESS	24.8	84.7
ENGINEERING SUPPORT	86.1	94.1
GENERAL SUPPORT	72.0	96.5
AFTEC	8.6	12.3
RENEWABLE ENERGY SYSTEMS	-	25.6
TOTAL	\$1491.0	\$2408.7

SOLAR OR WIND ENERGY FOR SHELTERS

A second interesting program I will just mention in passing is, along with the Department of Energy we are working on a renewable energy system to provide the power for MX. We are exploring this with them and our thought was that when we build 4,600 of these shelters in the Southwestern United States, each of which has an electric draw of a good sized American house, and that this might represent a rare opportunity, particularly given the favorable climate of that area, to do something in a large-scale way in terms of solar energy or wind energy, or some other renewable source.

Heretofore almost all of this work has been done one by one, and we think there might be some opportunities to do something very useful there.

That was the research and development budget.

MILCON PROGRAM THEN YEAR \$ M

	1981	1982
CONTRUCTION		
TEST FAC'S	17.1	13.6
OPERATIONAL FAC'S	0	361.4

DESIGN

TEST FAC'S	.1	.8
OPERATIONAL FAC'S	96.9	145.5

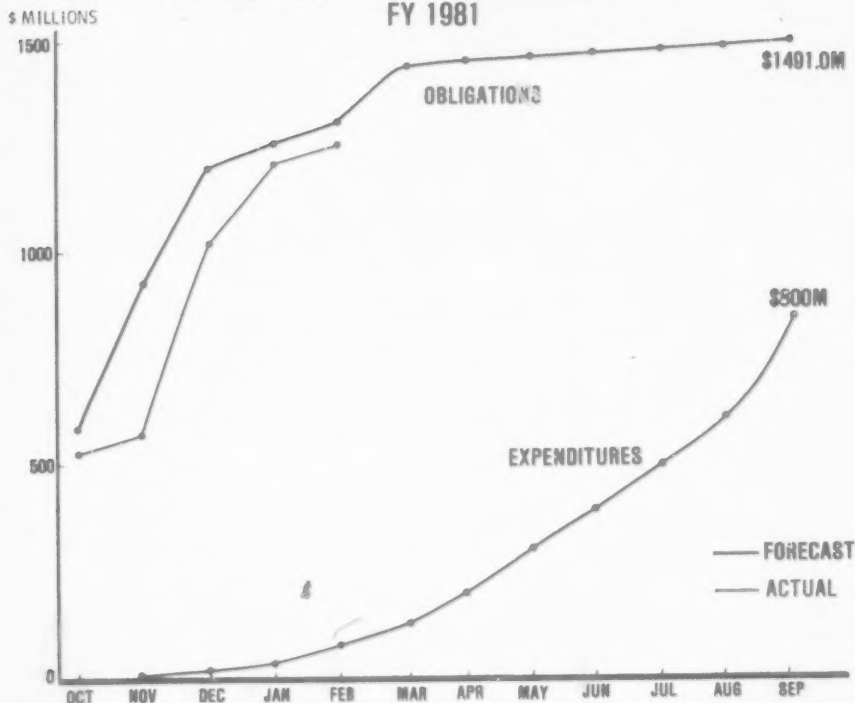
There is also military construction money in 1981 and 1982 for test facilities in both years, but beginning the operational facility construction in 1982, in April of 1982, specifically, and that certainly is one of the basic factors in meeting our schedule.

Questions were raised in the Congress during the enactment of the 1981 Appropriations Act, as to whether the program office could manage this large sum of money and expend it on schedule, or was there so much money in the 1981 authorization that it could not be properly spent? Indeed, based on that argument, there was ultimately a \$60 million reduction made in the appropriation as against what had been authorized.

This shows the program office planned and actual obligations and expenditures for fiscal year 1981, and there is a disparity there which frequently confuses the public, because, as you know from your experience, you obligate the contract and it may be some period of time before you actually pay the bill when the work is done; but you have to have the authorization and appropriation before you can legally make that obligation. So it is a dilemma.

M-X OBLIGATION/EXPENDITURE RATE

FY 1981



But this is the plan to which our program is working. You recall the appropriations bill did not come out on time and we operated under a continuing resolution for a period of time, and rather conservatively. We held down our obligations until we got the actual appropriation. Then we moved up very smartly and you have virtually all of that obligated by the time the year is less than half over, and the expenditures are running right along the line. So that really does not appear to be a problem.

Senator WARNER. On the other hand, is there a legal problem? Let us take March, and put that pointer at March. Suppose you made a sudden decision to go to another basing mode, you have to get yourself out of all of those contracts, and a good deal of money has been expended. I suppose those lines represent the commingling of missiles and basing money?

CANCELLATION OF CONTRACTS COSTLY

General BURKE. The majority of it is missile, but clearly the decision on basing mode would result in cancellation of some number of those contracts.

Senator WARNER. What kind of clauses do you have to enable the Government to get out from under those contracts? Are there pretty heavy penalties?

General BURKE. It would inevitably be expensive.

Senator WARNER. And every day and week that goes by, that expense curve goes up in terms of the cost to the taxpayers, over a change of decision?

General BURKE. Yes, that is true. I might also add that the General Accounting Office has established a full-time office in the Ballistic Missile Office to monitor all of this, and I am sure if we do have any problem meeting our goals and objectives, you will hear from them, quite promptly.

MAJOR ACHIEVEMENTS

CY 1980

COMPLETED

SYSTEM DESIGN REVIEW

TRANSPORTER ROAD MOBILITY TESTS

FILED DRAFT EIS

**ACCUMULATED ONE MILLION HOURS ON ADVANCED
GYRO WHEELS**

MINER'S IRON UGT

Some of the achievements of the past year that we did complete are important designs both for the missile system itself and for the basing mode that we have already discussed, and we had successful tests with the transporter that I showed you. After 2 years of preparation, we filed our draft environmental impact statement just before Christmas and I will talk more about that in a minute. We accumulated a great deal of test information associated with the guidance

system, giving us high confidence it is a successful system. And we conducted an underground nuclear explosion for the purpose of measuring the effects of nuclear radiation on various components of the system, and all of that was quite successful.

KEY ACTIVITIES CY 1981

ALL MOTOR STAGES TEST FIRED AT SEA LEVEL

INITIAL MOTOR TEST FIRINGS IN ALTITUDE CHAMBERS

SLED AND CENTRIFUGE G&C TESTS (HOLLOMAN AFB)

**MISSILE SYSTEMS CRITICAL DESIGN REVIEW
(FIRST FLIGHT HARDWARE)**

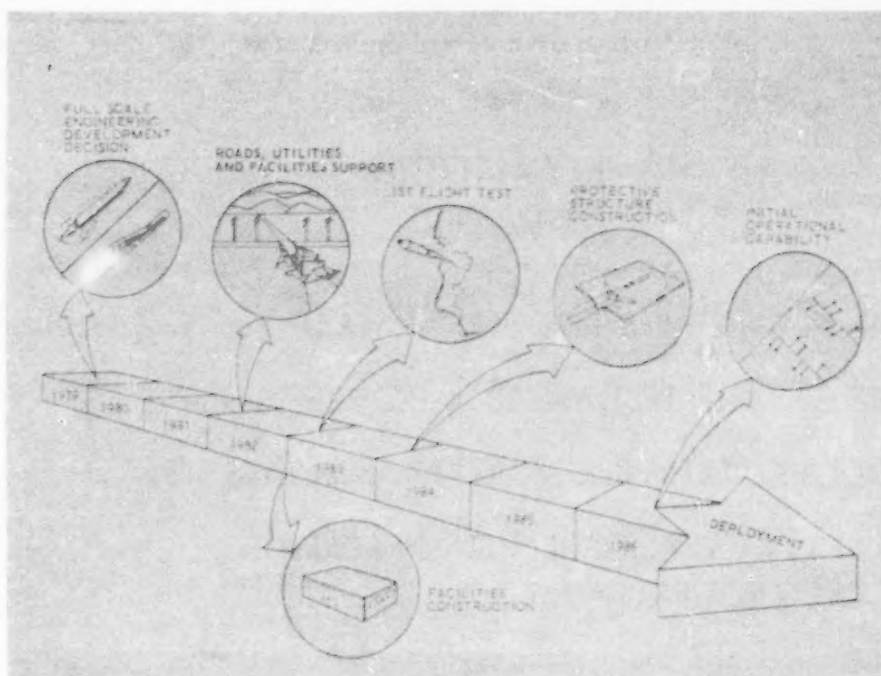
FILE FINAL EIS -- INITIATE LAND ACQUISITION

INITIATE INNOVATIVE SHELTER CONSTRUCTION TEST PROGRAM

ROCKET MOTORS TESTING

There is some activity underway in 1981. We will continue testing of those rocket motors; all three will continue to be fired at sea level. Additionally, the second and third stages will be taken to altitudes by the guidance control systems facility at Holoman Air Force Base and put it on sleds, to simulate pulling high loads that you would with a missile launch, to check its sturdiness. We will also complete our missile systems critical design review preparatory to the first flight of hardware this year and file the final environmental impact statement, which will open the way to begin to acquire the land.

Finally, we are beginning a program with two major construction firms for innovative ways to build those shelters both in terms of reducing the dollar cost and reducing the number of workers who would be required. That looks very promising.



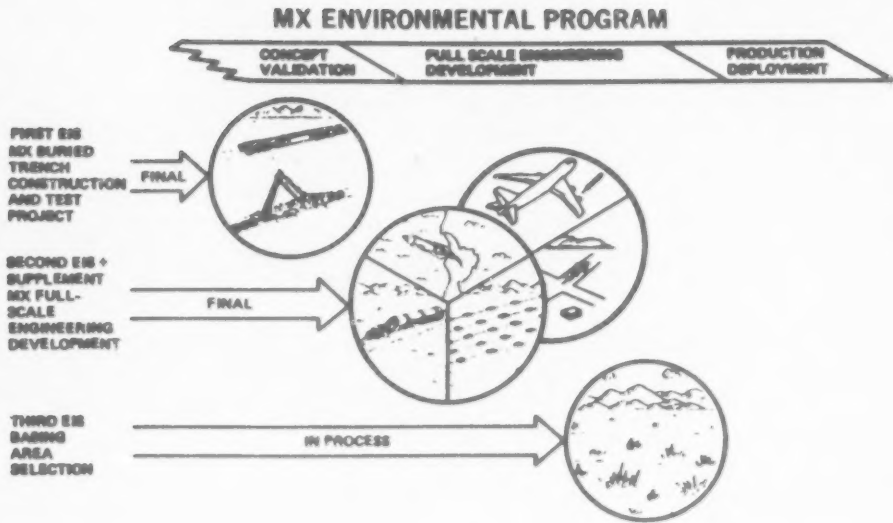
The critical path to our initial operational capability, IOC, date, which is July of 1986, is shown here. This is the engineering decision. As I indicated, engineering development was approved in December of 1979. We have been proceeding with that.

The most important item in this path is shown here, and that is the construction of the roads and the utilities and facilities which are scheduled to begin in April of 1982. Before that can begin, we must complete the environmental process and the land process. That, to my mind, is the pacing factor. We begin construction of the main bases and assembly areas in early 1983, and about the same time we start actual flight test of the missile, and we begin construction of the shelters themselves in early 1984, leading to IOC, initial operational capability, in 1986.

The environmental impact statement that is currently under consideration is actually the third that has been filed. The first had to do with a test we did of the trench and, Senator Goldwater, you will recall it took place in your home State, and that was received favorably, and we had no legal obstacles to it.

The second was done in connection with the full-scale engineering development and most of that centered around construction of the facilities at Vandenberg Air Force Base; and, again, we didn't have any difficulties with that.

The third, though, is far more complicated and more detailed than either of the first two, and that has to do with a document that will support the selection of basing area and the operating bases.



NARROWING PROCESS

CONTINENTAL US

SOUTHWEST

CANDIDATE DEPLOYMENT AREAS

NEVADA

UTAH

TEXAS

NEW MEXICO

REASONABLE DEPLOYMENT AREAS

7 OB LOCATIONS

SUITABLE OPERATING BASES

DEPLOYMENT AREA SELECTION

That is in work now. I will show you the schedule we are working to. That document which is designed to support two major decisions—one is the selection of the deployment area or areas in which these missile fields will be located, and the other is the selection of the specific operating bases that would be in deployment areas. To get to where we are now, we went through a narrowing process over a period of several years. We started by considering all of the continental United States for deployment of this system, and we established some criteria having to do with geology and cultural features. The thing we were looking for was land where both the water table and bedrock were no closer than 50 feet to the surface.

We also, for security reasons, preferred to locate this not near populated centers.

Out of that, we focused on the Southwest United States and identified seven large regions that appeared largely satisfactory.

From that we applied some operational factors and there we thought it would be desirable to stay at least a couple of hundred miles away from the seacoast or from a foreign border. We thought it would not be desirable to overlay this on some existing Minuteman systems, and out of that we came up with two deployment areas, that is, the Great Basin of Nevada and Utah, and the High Plains area of Texas and New Mexico.

The Great Basin of that is in the highlands of Nevada and Utah, and within that region we have identified seven locations that would be suitable for the operating bases, depending upon which regions you select.

Senator WARNER. That is just for the record, since this record may be read by others of our colleagues. We have tried to make this record quite complete.

Senator EXON. I think for the record when you get into the regions, you just said you didn't feel that the MX should be located in areas of Minuteman, or with Minuteman. Why, for the record?

General BURKE. You would not wish to locate one potential target approximate to another potential target.

Senator EXON. In layman's terms, you don't want to put all of your eggs in one basket?

General BURKE. Exactly.

WATER—A SERIOUS SITE FACTOR

Senator GOLDWATER. Isn't another important reason that it is going to take a population of about 30,000 to support this system, and you have to have water for that many people, and you can't find that water, for example, in Arizona, I know, and we looked at it there. Isn't that a major factor?

General BURKE. Water is an important factor and I intend to speak to that a little later. I will just say at this point that in either Utah or Nevada or Texas, that does not appear to be a limiting factor. We know a great deal more about the water circumstances in Nevada and Utah than we do any other locations. We have done more drilling there.

Senator EXON. I have one more question, because I think it is critically important: General, when and if we deploy the MX in its total array, the Minuteman, I am assuming, would continue to be an important part of our deterrent. For how many years would that be? Would it be indefinitely?

General BURKE. Indefinitely, sir, and that would depend on what assumptions you would make about further SALT limitations and what will be allowable levels. But under current planning there is no projected end to the Minuteman force.

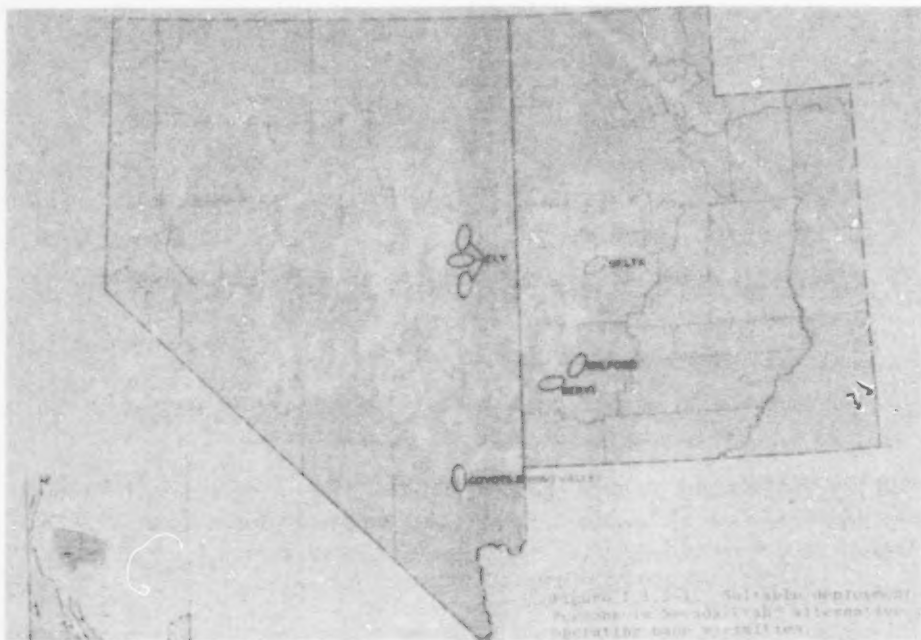
Senator EXON. Or to put it one other way, the MX would be in addition to our Minuteman array?

General BURKE. Yes; that is correct. It is on the assumption that at least a major fraction of the Minuteman will be retained.

Senator EXON. Thank you.

OTHER POSSIBLE DEPLOYMENT AREAS

General BURKE. The alternatives for deployment that are still possible under the processes are: The entire system could be placed in Nevada-Utah; the entire system could be put in Texas and New Mexico; or, we could put it approximately half and half. Any of those could be supported by the environmental impact statement.

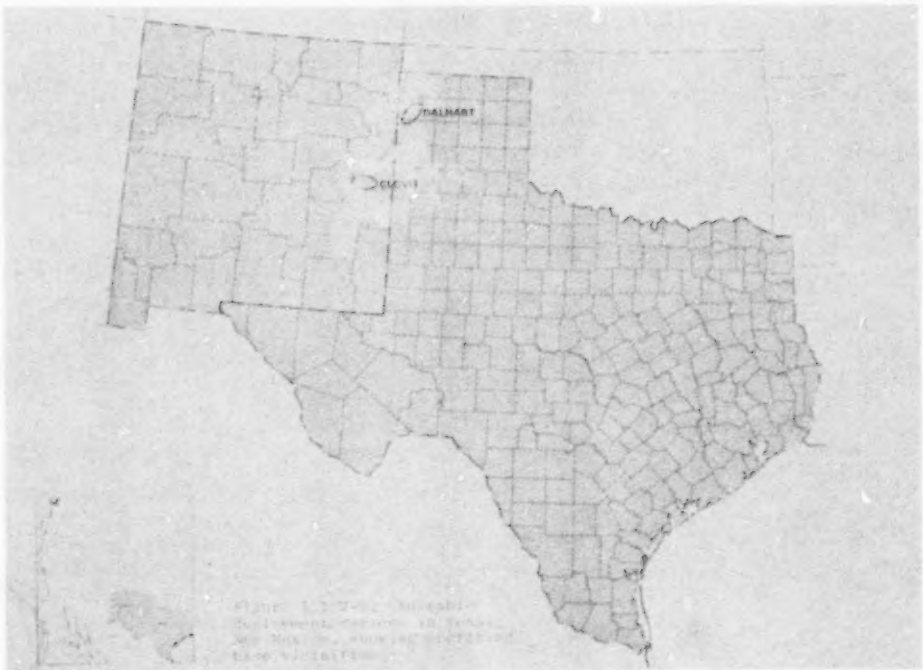


This is the Nevada-Utah region. The white area is the valleys that are thought suitable for this purpose. The black spots are the potential main operating bases. We actually looked at three possible sites around Ely, Nev. At this point [indicating] this is Coyote Spring Valley, about 65 miles north of Las Vegas; it is probably the preferable area in the Nevada region, and Milford, Utah appears to be the best of the three that are over there.

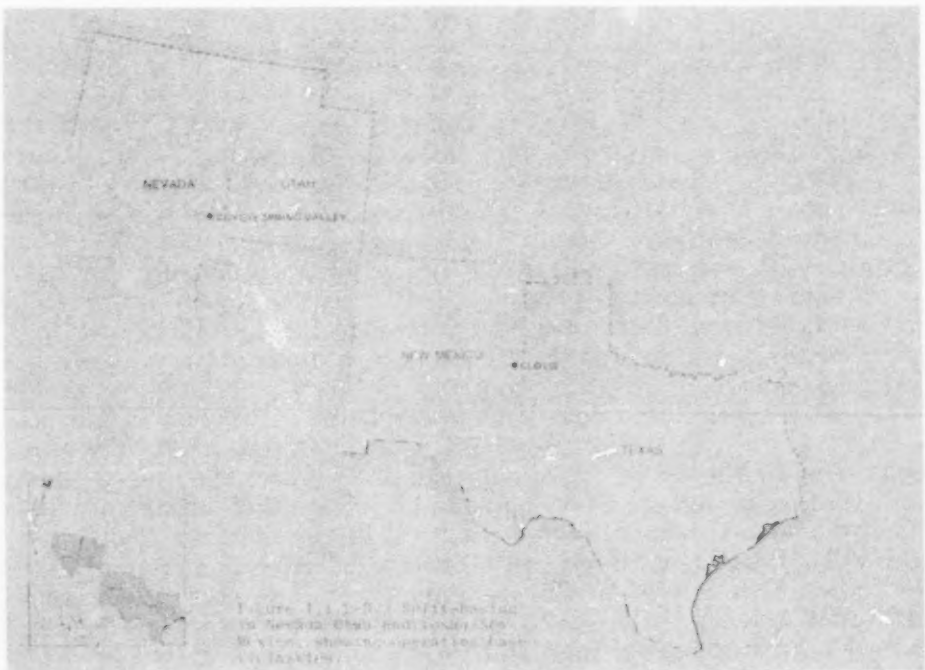
Senator GOLDWATER. You have plenty of water in Coyote Springs, but what about up north?

General BURKE. There does not appear to be a problem at all. I have one slide which would offer a more authoritative opinion on that than my own.

You are right. There does not appear to be a problem in Coyote Springs. In fact, the county commissioners of Clark County are very supportive of the notion of having this base there, and they agreed early on that if there is a problem of water there, they would provide the water from their unallocated resources in Lake Meade. That is not desirable, if you have to pump it up there, but as a matter of fact we drilled a deep well in Coyote Springs and we contracted for a 3,000-foot well, and when we got to about 700 feet we were flooded, and we have stopped drilling, and we are now assessing that area.



This is Texas and New Mexico—Dalhart, Tex., again the white area would be the general deployment area. If we put it down there, the two bases that we would select, would be at Dalhart and Clovis. Clovis would be an extension of the area of Cannon AFB.



Finally, if we elected to divide it between those two areas, probably we would go with a base at Coyote Springs and a base in New Mexico, here.

KEY ISSUES

Population growth, economic impact, water/land use, grazing, mining, mitigations.

These appear to be the key issues in regard to the environmental assessment as evidenced by the inquiries we have and the responses we get from citizens and officials of the regions we are looking at.

The population growth is something that has to be looked at very carefully. On the other hand, we would be dealing with a known and predictable growth that ought to lend itself to a reasonable degree of management.

Within the 12-county area of Nevada and Utah, it is predicted that those 12 counties will grow by an average of 3.2 percent per year for the next 10 years without MX. If MX comes in addition to the other things, it is predicted they will grow 4.2 percent per year, so it is that additional increase that would be the consequence of MX and, obviously, additional growth in an area already growing requires management, but that does not seem to be insuperable.

AVOID BOOM/BUST TOWN

We think we can avoid a boom/bust out there. There are going to be something like 20,000 construction workers at peak to build this system, but it should be possible to manage that construction phase in such a way as you discourage and hold down the number of additional dependents that come in there.

First, you try to recruit as much local labor as you can and, second, where you bring in outside labor, you set up terms of employment which discourage bringing a family in, so the total population is not too much more than the total population increase, and not too much more than 20,000.

As we transition into the full-time operation and as the permanent Air Force military and civilian people arrive, that is a work force of about 13,000; but they obviously would be coming for the long haul and they would bring their wives and children.

BOOST TO STATE'S ECONOMY

So if you overlay one on the other, I think it would be possible that there would be steady growth and not any Alaska pipeline boom and bust. That has great impact on the local economies. A lot of money is going to go in there and a lot of people are attracted to it; but, on the other hand, there is nothing you can do of that magnitude that is not going to have an adverse impact on somebody. I think those States will be full employment States for a long time to come. I think people who have businesses that are critically dependent upon labor at less than prevailing wage rates will have difficulties in that type of environment; but, anything that brings general prosperity to the States would have that same impact.

As to the water, as Senator Goldwater knows, it is an emotional issue. Water is life there and it means prosperity. MX uses a little water in its construction, water that goes in cement, but that is relatively a trivial amount. The water associated with MX is water associated with the people. The average American uses about 100 gallons of water a day. I am told that is correct. Once construction is complete, the only water that MX will use will be water that those 13,000 people and their families use. Anything else that adds that number of jobs, that additional income to the State, has to use at least that much water. It does not appear to be a problem.

Senator WARNER. As we build those pipes, can't they use the improvement so the net loss is minimum?

General BURKE. Yes; we can do that. I offer you an authority considerably more believable than myself. This was just a couple of weeks ago, February 15, in Salt Lake. I will take the liberty of reading it to you.

Utah has ample water for the MX system and all proposed energy developments without cutting into present agricultural supplies, according to the Utah Water Resource Division. The agency just released its report and it emphasizes that water will not be a limiting factor to either the missile system or the projected synthetic fuel industry. Despite some political statements to the contrary, water is simply no problem in connection with these developments.

I really don't think water is a problem, but certainly it is an emotional issue.

As to land use in that area of Nevada and Utah, if you drew a ring around all of those valleys, it would encompass some 70,000 square miles. You see in the paper from time to time that MX was going to require withdrawal of all of 70,000 square miles, equivalent to the State of Pennsylvania, for those missiles. But within that vast area, the proposal fits in only those little 2.5-acre sites, plus the main operating bases, and if you add all of it, it comes to less than 25 square nautical miles, and the remainder is open to the public and available for multiple use, just as it is now.

IMPACT ON GRAZING

So when you look at it in terms of impact on grazing, if you did nothing to mitigate the loss of grazing, the lost AUM (animal unit months) is the way the ranchers express it would be less than 17 (about .72 percent) before mitigation. We are confident we could easily compensate for this disturbance by a number of measures. We would allow mining rights up to the edge of those 2.5 acres' fences, and we have agreed if somehow mistakenly put one of our sites right on top of a mother lode, and it couldn't be mined, we would remove it. The Utah Mining Association has unanimously endorsed the MX system and finds it compatible with their interests and necessary for national security.

Mitigation is a major and pervasive problem that has to be thought of. Every adverse effect of the MX can in varying degrees be offset, and we need to think very carefully how we do that, but, most importantly, how we manage the impact on the local society as we get fairly large numbers of people out there in a fairly short period of time.

President Carter pledged to the Governors of Nevada and Utah last year that the Federal Government would meet its full responsibilities in mitigating the bad effects, and I would certainly not expect President Reagan to do less.

Senator WARNER. If you put the installation on the mother lode, you would move it, and it wouldn't be expensive? I think you had better clarify that. You would first ascertain the presence or absence and then go forward with the construction?

DEPLOYMENT IN NON-MINERAL AREAS

General BURKE. We are doing a certain amount of mineral surveying in avoiding places where it is thought there would be valuable mineral deposits. Some people propose that we ought to do exploratory drilling at each of 4,600 sites. That is terribly expensive and we said we wouldn't do that, but instead if it proved we had inadvertently sited on a dome of an immensely valuable body of ore, we would move it. We could do that for a few million dollars.

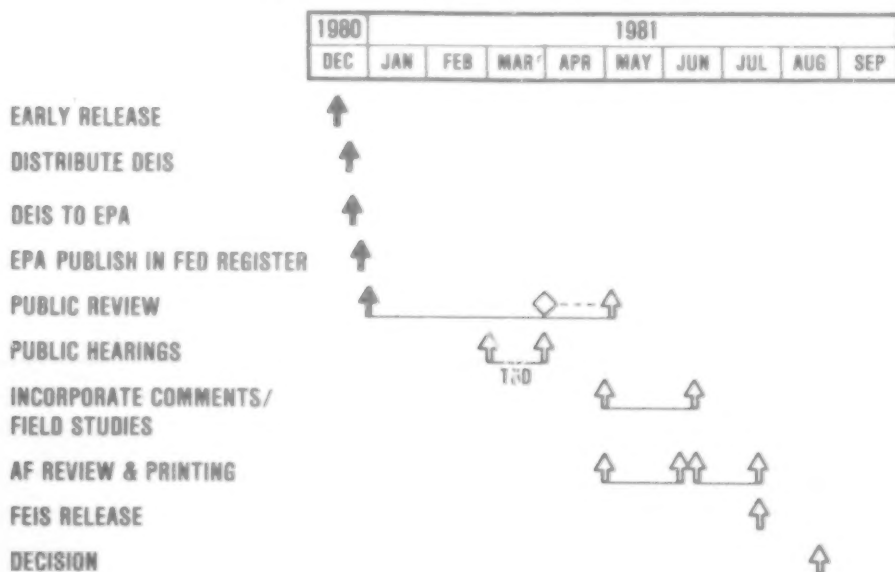
Senator WARNER. Don't discover a major oilfield.

General BURKE. You don't have to drill those holes straight, you know.

Senator GOLDWATER. Most of those valleys are alluvial valleys and contain no minerals and the so-called mother lodes are found up in mountains.

General BURKE. I think in the entire region there is only one operating mine in an alluvial valley. That is molybdenum. All of our planning is keyed to successful movement of our impact statement.

DEPLOYMENT AREA SELECTION & LAND WITHDRAWAL/ACQUISITION EIS



This is a schedule to which we were working. We released it just before Christmas. We officially started a public comment period on the first of January. The law requires 45 days for comment on environmental impact statements. Because of the size and complexity of this one, we allowed 120 days. I might say it is an enormously complicated document; it is almost 2,000 pages in length, and represents 2 years' work and some \$19 million.

In spite of that, or not surprisingly, as soon as it came out the critics said, "It is insufficient and inadequate and you must do more."

We will publish hearing schedules in the near future which the law requires and following those hearings we will need a period of perhaps 2 months to incorporate all of the comments that we have received through the public hearings and by mail and otherwise. We can put that in an orderly manner and publish it, and we would expect we could get that done no earlier than July 1.

There are obviously opportunities to delay this process and if in reviewing the draft we find there is something that really has to be changed in it, then we might have to do that.

Senator GOLDWATER. Have you finished your environmental studies?

COSTLY LARGE EIS

General BURKE. We have finished them to the extent we were able to publish the draft of the environmental impact statement, which, as I indicated, has got almost 2,000 pages and 10,000 pages of the supporting technical documents. Even so, we would not believe that the Air Force and our contractors are sufficiently smart to have thought of everything, so I think we will get legitimate complaints.

Senator GOLDWATER. Do you know how much you have spent on that so far?

General BURKE. Nineteen million dollars.

Senator GOLDWATER. Just on an environmental impact report?

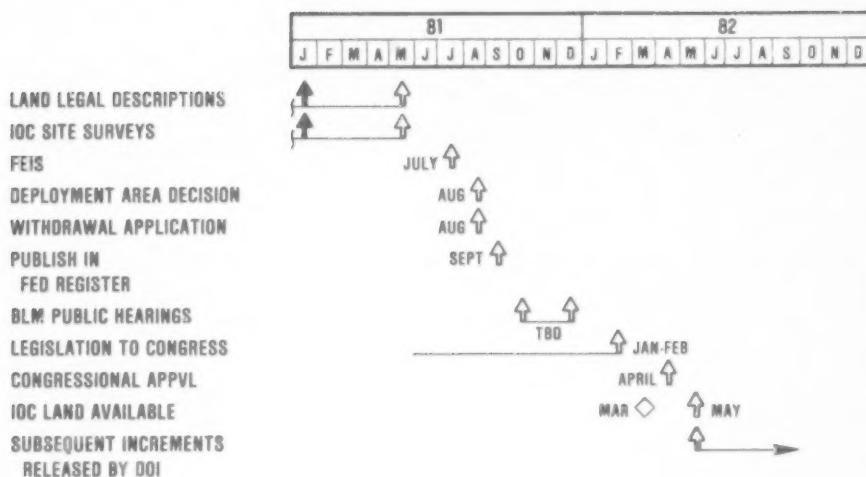
General BURKE. Yes.

The key dates here are that we can file an environmental impact statement no earlier than July. There is a possibility that might even be a little later. That is the document that the President legally is required to make a decision to begin to withdraw land.

The law further requires that after it is filed, 30 days must go by before he can take any action. So August would be the earliest date.

Now, once the final environmental impact statement is filed, 30 days go by and then the Presidential decision is made, and the applications are submitted for withdrawal of land. That then has to be published in the Federal Register and the law requires in regard to the land withdrawal that the Bureau of Land Management then must hold another set of public hearings to consider the setting aside of this public land for this specific purpose. In the normal course of events after that was completed we would then submit the request for withdrawal to the Congress and that would take place around January or February of

M-X LAND WITHDRAWAL



◇ DATE LAND REQUIRED

next year; and on a very optimistic schedule this would show Congress acting in April on that, and that would allow us to start construction in May, but that turns out to be a little late. We really need a decision in March to start in April, so we are exploring again with Members of Congress and their staff if there is not some way we can get something over to the Congress earlier, and you could consider that and make a general decision, and then to be made specific after all that other process is complete.

LAWSUITS A DELAYING FACTOR

Senator WARNER. What is your understanding of the legal situation? A lawsuit could be filed at any juncture and then that does what, General?

General BURKE. There is considerable difference of opinion on that, Senator Warner. My own view after some study, that the power of obstructionist groups is somewhat overrated, based on a very successful early history. Others don't share that view. The National Environmental Policy Act which was enacted in 1969, along with the Endangered Species Act, and the Preservation of Wild Burros Act, and I believe about 17 pieces of legislation that come to bear on a problem like this. It is fair to say that in the early days those in Government and otherwise occupied with building projects didn't understand all of the intricacies of that legislation.

The environmental opponents of projects won a lot of victories in those days, and the most famous is the Tellico Dam that was stopped because of the snail darter.

But I think you can go back and review that and it would be fair to say that the reason that case was lost was not because of the impact but the supporters of the dam had never heard of the snail darter until they were confronted with it in court. They hadn't done their homework. I think we in the building business have learned a great deal over the past few years, and in the Air Force we have been consistently successful over the last several years. We built two large radars, one at Cape Cod and one in northern California, and both areas are not wanting for those who would protect the environment. Predictably, we were sued in both of those cases, but the judges were never willing to grant an injunction.

That is the key to the thing, that while we were litigating we were also building, and we started on schedule and we finished on schedule, and those radars are providing a major contribution to our defense today.

I would hope that is the model of the future and not Tellico Dam, but you can get a spirited argument on this question. We have had some very able lawyers and some very able environmental specialists who have studied this, and generally they take a cautiously optimistic view of it, but it remains to be seen.

Senator EXON. Just following up on that point, General, if I understand your chart there, the bottom line is that your present schedule is likely to start construction in March of next year; is that correct?

General BURKE. We would like for the Congress to give us that land and make it available to us in March, and we can start work in April of 1982.

Senator EXON. Let me ask you this question: Suppose you had a magic wand in your hand and you could wave all of these problems we have, or potentially have, legal and otherwise, if you could do that, how much would that speed it up? Would it significantly speed up the time, and we could get the MX IOC with an advance of 6 months, or would it advance it a year if you would wave a magic wand?

General BURKE. At this point we have the missile development schedule very tightly tied to what our expected ability to withdraw that land is. We could probably go back, we could wave that magic wand, and speed up that missile development some.

I think our program manager would get a little nervous as soon as we started with that because he has a schedule which allows him to do testing and improvements and so forth, and he would be, properly, wary of compressing that.

So I think the right goal is just to try and stay on this course.

Senator EXON. Thank you.

SPLIT BASING

STUDY SUBMITTED 19 JAN 81

DIRECTED BY FY 81 AUTHORIZATION ACT

CONCLUSIONS

NO OVERRIDING ADVANTAGES/DISADVANTAGES

ENVIRONMENTAL

OPERATIONAL

ARMS CONTROL

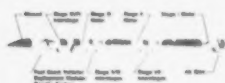
ACQUISITION COST INCREASE - \$3.5 B

O&S COST INCREASE - \$ 19 M PER YEAR

General BURKE. Congress has asked us to look at the question of splitting the basing, and we have done that, and we reported that to you formally in January; the conclusions were fairly simple: There are no overriding advantages or disadvantages from either environmental or any other feature. It does cost more, about 10 percent, \$3.5 billion to build it, because you have to duplicate a lot of assembly buildings and a lot of support facilities and it costs a little more each year to operate.

M-X

MX Missile



COST SUMMARY

	FY 78 \$	THEN YEAR
RD&E	6.78	10.68
PROCUREMENT	12.98	26.38
MILCON	9.08	19.18
	28.68	56.08

		FY 80 & PRIOR	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RD&E		822.4	1491.0	2408.7	2278.8	3598.8	10599.7
	A/C	-	-	-	76.5	514.7	591.2
WPN SYS PROC		-	-	-	1776.2	23923.3	25699.5
	MSLS	-	-	-	-	-	-
MILCON		64.5	114.1	521.3	1983.7	16413.9	19097.5
	A/C	-	-	-	2	22	24
QUANTITY/DELIV		-	-	-	9	321	330
	MSLS	-	-	-	-	-	-

If you look for a minute at the expected cost of the MX, we started this program in 1978 and in dollars, the estimated cost is \$28.6 billion. If you allow for predicted inflation at the estimated rates—and no one has too much confidence in those—for 1999, this number of dollars equals this number here [indicating]. That is often or invariably confused in the press, to go from there, and you would say there has been a big increase in the cost projection, and that, of course, is just inflation impacting on that as it does on anything else.

Senator STENNIS. What is the total?

General BURKE. In 1978 dollars, it is \$28.6 billion, and it is \$56 billion over here.

Senator STENNIS. Thank you.

General BURKE. A question that is often asked is, Can this system as it is proposed cope with increased threats? I think that is one that warrants a very serious study, and indeed we have looked at that in great detail, and I would like to report a little bit on those findings.

UNITED STATES-U.S.S.R. COMPLY WITH SALT RESTRAINTS

First, an error that is often made is to make an assumption that SALT II would mean the end of all defense systems. I don't believe that that is true. Even though SALT II is clearly in limbo now, both the United States and the Soviet Union as of this day are imposing certain restraints on their forces more or less in conformance with the terms of SALT II.

We see the Soviets dismantling nuclear submarines to comply with those limits that were in SALT II. Indeed, we both continue to follow the provisions of SALT I which expired in 1977. Additionally, there are some very real restraints on the Soviet Union. They are resource limited and in many ways worse than we, but they are willing to put in a larger fraction of their resources, but they are putting 13 or 14 percent in the military force and there has to be some limit to that;

and within the military sector there is a lot of competition for that money.

Additionally, another restraint is that the Soviet Union has to worry about the United States, and they do worry about the United States, and I will get back to that point a little later.

When SALT II apparently failed, some people came out and said, "That means the Soviets are going to build many tens of thousands of warheads now, and if so, the MX system won't work."

First, I don't think that they are going to embark on an unbridled buildup of nuclear warheads, but if they do we not only have to worry about an MX system, but we also had better worry very much about the other two legs of the Triad. Particularly, if they have tens of thousands of warheads and there is no MX, we would have real concerns for both submarines and bombers, because that would be enough to bombard vast regions of the ocean or our bombers on their flyout corridors.

MX in a properly designed MPS system can be expanded to counter any increased Soviet threats. We can do that at a cost somewhat less than the Soviets would have to spend for that threat, and I think if at the outset we make it clear that we are building the MX to respond to the posed Soviet threat, and we have both the capability and the will and indeed the determination to match any future threat, we ought to discourage them from wasting money trying to threaten MX in the future.

M-X

RESPONSES TO INCREASED THREATS

THREAT

FRACTIONATION

INCREASED BOOSTERS

RESPONSES

INCREASED SHELTERS OR MISSILES OR BOTH

ANTI-BALLISTIC MISSILE DEFENSE

Now let me just make a point about what that threat is.

It is in two ways: It is held out that the Soviets could vastly increase their ICBM warhead by fractionation; that is, putting smaller warheads on an existing missile. People would imagine that those could be replaced by perhaps [deleted] smaller warheads, or they could simply add boosters and they could build more SS-18's and put them out.

Our responses to that are twofold: One is, we can add additional shelters and missiles and various combinations and maintain the same degree of survivability we would have if they had not increased their threat, and I would think we might be prepared to do that up to some point; but the ace in the hole we have with the MX system is that it makes a very happy marriage with a ballistic missile defense system, and that is because of the leverage that you get from being able to preferentially defend only our loaded shelter. If the Soviets attack the 23 shelters with warheads, you would only have to defend the one that was loaded and ignore the other 22. This is very favorable to us in terms of cost by a factor of 5 to 1.

ABM TREATY

I am not proposing the United States unilaterally abrogate the ABM Treaty. You couldn't do this under the ABM Treaty, but this is something that we hold in prospect if the Soviets do embark on an unbridled buildup and dramatic increase in their ICBM weapons, and we have this as our ace in the hole.

Senator WARNER. Let me clarify that. You could design an ABM system to protect that one shelter that has the missile and that ABM system would be situated, of course, in the area of a cluster but targeted in such a way as to protect any one of the 23 shelters at any one time?

General BURKE. It would itself be in one of those 23, the ABM system.

Senator WARNER. Then you would have to have 23 ABM systems?

General BURKE. No, just one for each 23.

Senator WARNER. I don't understand it. You would have 23 shelters, where would the ABM system be located?

General BURKE. In any of the 23 shelters.

Senator WARNER. In any of the 23 shelters, and it could then, in turn, be targeted in such a way as to protect any of the other 22 shelters?

General BURKE. Yes, but it would, in fact, be targeted to protect only the one that is loaded.

Senator WARNER. At all times you shift the targeting as you would the missile?

General BURKE. Yes. The key to it is you don't have to have it very far away. That warhead has to explode within a few hundred feet of your shelter because the shelter is fairly hard. So if you can just keep it, say, a mile away, you can do the job. You would intercept it at 5,000 feet and you don't have to get it way out in the atmosphere.

Senator STENNIS. This has been an amazing presentation that you and the other gentlemen have given. You have been with us a long time, and I commend you highly for your work.

Now, all last year and even before, the charges were thrown to me or put up to me in various ways that this was all a hoax and had no good faith. It wasn't the intention of the administration to ever build this or anything of that kind.

There is some kind of a report out that I'm not favoring the MX, and I mention that to you gentlemen now to show there is no basis for that at all.

But now, what is your main determining factor? Is there the time element that is based on getting this very work started here? Is that the pacesetter?

General BURKE. The pacesetter is the environmental impact statement and the withdrawal of the land.

Senator STENNIS. So, it is just a matter now of getting started on these actual installations and that determines your speed; is that right?

General BURKE. Yes.

Senator STENNIS. In this entire MX process, have you been delayed for the lack of money from the Congress?

General ALLEN. I am unable to go back very far, but since we have actually decided upon a program to proceed, the Congress I believe, has supported our requests in general quite adequately.

Senator STENNIS. And you gentlemen agree on that?

You don't have any impediment in the program? This is still what the Air Force recommends; is that right, General?

General ALLEN. The program we are describing now is the program the Air Force recommends.

Senator STENNIS. Is that what you want? Is that what you are making a drive for?

General ALLEN. It is the highest priority activity within the Air Force activities.

Senator STENNIS. That is a very good way to put it. The word is "go" and you want to get this thing moving, as I understand your testimony?

General ALLEN. Yes.

PROJECT ON SCHEDULE

Senator STENNIS. And you have a time schedule here and an operational date of 1986; is that correct?

General ALLEN. Yes.

Senator STENNIS. You think that is attainable at that time?

General ALLEN. Yes.

Senator STENNIS. You made allowances for any calculated delays and you believe you can meet this time schedule?

General ALLEN. Yes, sir; that is correct.

Senator STENNIS. I just wanted to ask you that and get an affirmative answer to have something that I can quote and use. Let me mention here that the Appropriations Committee worked hard at this matter, but they don't really have an opportunity in the course of the year to come in contact with this as much as we do here on the Armed Services Committee. So you can concentrate on getting them informed. They will make the judgment.

If we are going to have this system, you have to have a decision now; is that right?

General ALLEN. We must keep moving, yes.

Senator STENNIS. Those are the main points that I have in mind. Again, I commend these gentlemen.

Doctor, you have been with the MX program for about 14 years?

Dr. ZEIBERG. About 14 years.

Senator STENNIS. Since it was an active program?

Dr. ZEIBERG. In Washington 4 years, and 10 years prior to that.
 Senator STENNIS. You have been in the Pentagon at least about 4 years?

Dr. ZEIBERG. Yes.

Senator STENNIS. Do you have anything that you want to add to the questions I have asked, or make any observations along that line? I think the time has come to make a decision, and we want to do it as rapidly as we can. What is on your mind, Dr. Zeiberg?

Dr. ZEIBERG. I agree with General Allen's answers to your questions and, of course, I am obliged to help Secretary Weinberger review this so that he can draw his own conclusions.

Senator STENNIS. That is very fine, but there is no lurking doubt or uncertainty in your mind about the system?

Dr. ZEIBERG. That is correct.

Senator STENNIS. I thank you, Mr. Chairman.

Senator EXON. Are we continuing with the briefing?

General BURKE. I was addressing the question of increased threat to the MPS system, and would it sort of collapse in some case, and I made the point that that threat could come from an increase by the Soviets or adding additional boosters. We can respond either by building shelters, by making more missiles or by some combination that is a little cheaper than their cost, not much but a little, or we can look at an antiballistic system which is a lot cheaper.

This is a plot of cost and projected cost of our ICBM going back to 1970. [Chart deleted.] Up to this point here [indicated] in 1981, we spent [deleted] less than the Soviet Union, or, stated another way, the Soviets have made large investments in ICBM's over and above ours, with the obvious and evident purpose of putting at risk our silo-based ICBM's.

There is no other explanation I have heard offered as to why they would spend that huge sum of money and build those very accurate missiles. You don't need that expensive accuracy if you are going after cities or army bases or navy bases. So MX, to begin with, must redress the effects of that cumulative Soviet investment.

Senator WARNER. That is a dramatic statement. Let me see if I can get it clear. Is that 1970 in the lower left-hand corner?

General BURKE. Yes, that is cumulative.

Senator WARNER. The bottom line is the United States?

General BURKE. This is United States [indicating]. This is our actual expenditures to this point, and this line is our projected MX/MPS system, the cumulative investment we have made.

At the same time, if the Soviets do what is projected, they will have spent to this point here [indicating] at this end of this decade, a whole lot more than we have, and we would hold out the prospect that this is offsetting that, and so we have done pretty well with all of that work.

People say in the absence of a SALT II the Soviets are going to build larger forces than this, and if so, their costs are going to go up like that, and so if we want to maintain the same number of survivors, we build some more shelters and more missiles and our costs go up like that. But the cost relationship is not different, and it stays very much in our favor.

Senator WARNER. The delta there is what?

General BURKE. [Deleted.]

Senator WARNER. They have expended [deleted] in addition for their ICBM force, but now that is for perfecting their submarine force?

General BURKE. No; this is land-based ICBM's.

Senator WARNER. That isn't up in the chart?

General BURKE. It says, "U.S. ICBM" and by that we mean land-based ICBM's.

Senator WARNER. They have established [deleted] delta, and as I see that chart, the delta remains the same; it was fixed at 1981, and with the exception of a couple of minor variations, it stays right out there?

General BURKE. That is correct.

Senator EXON. For clarification, if I understood what the gentleman is saying, Mr. Chairman, if we proceed on schedule, the way the Air Force has it, we are going to have the equivalent retaliatory force for roughly \$60 billion plus what the Soviets would have with \$100 billion plus. Did I understand you right?

General BURKE. I would not express it quite that way. I would say for this investment we have maintained a survivable and effective ICBM force in the face of a much larger Soviet investment. I wouldn't say that they are equal. They have a larger ICBM force than we do and it is going to stay larger. They have a bigger fraction of their total force in ICBM's and we have a balanced Triad one-third bombers and one-third submarines and one-third ICBM's.

Senator EXON. I wanted to clarify this for the record. What you are saying, in layman's terms, is that you, General, and the Air Force and the Pentagon are satisfied with the course that you are on as far as the overall protective interests of the United States if we can proceed on that and if the Russians do not go measurably above what you show on this chart; is that a fair way to put it?

General BURKE. That is well stated, yes.

Senator WARNER. I think that you raise an important point. Let me try and put it the way I understand it: Even though that [deleted] delta in land-based ICBM systems remains relatively constant, the MX system as you now project it would establish a return to the balance of strategic parity, so to speak, to bring the two nations as described by General Allen in his opening statement—

General ALLEN. It would restore the capability of the ICBM which is required to maintain that balance. We in the United States also have to continue the programs on the submarine-launched ballistic missiles and the bomber activities to maintain the total balance.

Senator WARNER. I understand.

General BURKE. To state it another way, Senator, I would say that the Soviets have made their investment, and their very large one, to this point, largely for the purpose of denying the United States a survivable land-based ICBM system. Our response with the MX is to not allow that to happen.

Senator WARNER. These are the arguments that we need to take to the floor.

General ALLEN. The argument that General Burke is making is that the Soviets introduced three major ICBM's.

Senator WARNER. That is land-based——

General ALLEN. Land-based ICBM's, and they had a purpose in that; that purpose was to deny us the ICBM leg, giving them a major asymmetry in forces.

Senator WARNER. We have in place Minuteman and we had Titan, Minuteman, Minuteman II, and Minuteman III, and they introduced what system?

General ALLEN. The SS-17, -18, and -19, and we now propose to correct that situation to deny them the advantage that that [deleted] gave them by the investment which is shown there, to introduce the MX system. Even if the Soviets try again to offset that advantage, we can match that, too, and still have that be a favorable cost.

Senator WARNER. The new system provides us a flexibility to parallel track an incremental advantage which they try to obtain in their ICBM's?

General ALLEN. Yes.

Senator WARNER. Which flexibility we do not have with our current land-based ICBM system?

General ALLEN. That is correct.

General BURKE. This upper line holds out the prospect of a Soviet response to our MX which will be to increase the number of warheads that they have in their land-based ICBM force, and I am going to now try to make an argument as to why I don't think that they will do that.

People just assume that if we build a survivable system the Soviet response must be to build more weapons. This is a very complicated chart, [chart deleted] but if I could take a few minutes, I would like to talk you through it, because it has some very important and fundamental messages relating to this very complicated business of the missiles.

This is 1989, except this first grouping here, which deals with the year 1978, when we started the MX program.

What I am showing here are weapons that both sides own. These are in blue and are the U.S. strategic weapons of all types; and in red, the Soviet strategic nuclear weapons.

I want to break it down into three categories—the land-based ICBM's, the submarine-launched ballistic missiles, and the bombers.

Notice right off that we have a fairly balanced Triad in 1978. The Soviets have the preponderance of their force in land-based ICBM's. The key point that I will ask you to carry forward is that I am showing this in weapons, which is the measure that makes it look best from a U.S. perspective. If I were to change these paragraphs and make them equivalent megatonnage (EMT) even in 1978 you would see the Soviet Union ahead. But in 1978 we had more than the Soviet Union in terms of weapons.

Had the Soviets chosen to make a preemptive attack against the United States, they would not have gained any advantage in that relative relationship. Had the United States chosen to go first, we would have gained only a very slight advantage from our starting position, so that was a relatively comfortable position that did not appear to be any mathematical attraction for either to go first.

Now, I would like to move forward and compare that to what the world might look like in 1989 under varying scenarios:

First, I am going to imagine a world in which the Soviets have built what we expect them to build, and we elect not to build in MX's. We still have a few more weapons than the Soviets but, again, if we were making a comparison of EMT, you would see they were well ahead of us.

If the United States were to go first, we would not really improve our position against the Soviets. But if the Soviets go first, they do. They go from a slightly inferior position in weapons to a somewhat superior position after this, but it could be argued that that difference isn't enough that the Soviets would even contemplate such an attack.

But what I want to point out to you, which is of the utmost significance in this, is how much of the surviving U.S. fraction is in the submarine force. You see the vast majority of what would survive in that circumstance is represented by [deleted] submarines. Now, I would submit that if in 1989 our diplomats can make this calculation, it is going to be all the more difficult for them to conduct their business. This is going to underlie and worry them in any relationship we have with the Soviet Union. If they have any concern whatsoever about the absolute survivability of those [deleted] submarines, that worry is going to be compounded.

Now, to compare that to 1989, in which we have built an MX and MPS, if we have built the MX and the Triad is still well balanced and the Soviets are here. Now, if the Soviets preempt they don't improve their relative balance at all, they have not effected any improvement, they are not gaining. There is no reason to believe that they would prefer this position to this preattack position [indicating]. But now let me ask you to put on a Soviet hat and consider that instead of allocating resources for U.S. military, you are thinking from the other side, and here is the situation that is now evolved between now and in terms of what happens if we go first:

I would submit that the Russians do worry about the United States going first, and we see that evidenced in the very expensive and hard silos they spend for, and see that evidenced, as you correctly pointed out, they have their own submarines which are for that purpose.

The Russian commanders now have to be making their calculations and thinking about that.

Now, let me go to the next chart and show alternative approaches that they might take as to what has got to be a great problem with them. As someone said, their response will be to build some more silo-based ICBM's to pose a further threat to the MX.

This chart shows what happens. [Chart deleted.] Now, they have a whole lot more megatonnage, and now if they preempt against our system, they still don't do a very successful job at it. But look at it from their viewpoint again and the possibility of the United States going first. Once again, they are in a very, very vulnerable position. If they, just in response to the MX, start building missiles as fast as they possibly can from a technical point of view, this is the worse scenario that they can imagine. They build all of the way up here and they still don't overwhelm us because we have MX in MPS which we have expanded, and they have still not begun to redress their own problem, that they are vulnerable to a first attack.

They have to be able to do that same arithmetic. So, I will just in a very hypothetical way show another alternative, but one I think the

Russians are going to have to drive to if we deploy that MX; that is, a world in which neither side can go first, or can win mathematically by going first.

I would argue that in a world in which you have two major adversarial powers that have huge arsenals of nuclear weapons, the best world that can be imagined is one in which neither side can gain an advantage by going first, and, in fact, will incur a disadvantage by going first, and that is as much stability as I think we can hope for.

SOVIETS' ALTERNATIVES

There are two ways the Soviets can get to this position: One is that they can, in response to the MX/MPS, come back for some serious arms control negotiations and put such chips on the table that we will restrain deployment, and there is nothing magic about 4,600 shelters. We said that we could build more or less, or they are not interested in any sort of a bilateral understanding with us; they can do exactly as we are forced to do, and that is, spend very substantial sums of money on making their forces more survivable. They can build something like an MPS system or put more force in more submarines.

Either one of those is a lot more likely and certainly a lot more desirable than any one of these.

Senator WARNER. Thank you, General.

General BURKE. On the subject of the MX, I do have a few charts on Minuteman, but perhaps it would be appropriate to have questions in between.

Senator WARNER. At this point I have to ask to leave to go defend the Metro system before the Department of Transportation, and I know that is of some interest to those of us working here in Washington. I will ask Senator Quayle if he would assume the Chair for purposes of questions by those Senators present, and the record will remain open until 5 p.m. for questions for the record.

I anticipate, General Allen, that we will have another hearing after we have had the opportunity to study this record. Is that agreeable to my colleagues who are remaining?

You can proceed at your leisure on this matter, assuming that you are still available for a period of time.

General ALLEN. We are available and we are available to return whenever you wish us to.

Senator WARNER. Thank you very much.

Senator EXON. I want to add to what my colleagues have already said, Dr. Zeiberg and General Allen and General Burke, that this is an excellent presentation and I think if our colleagues would take time to read this report, if you would give them an overall appraisal of the MX. I think it was an excellent presentation; I compliment you on it and it was the best I have ever seen.

I have a question or two that I would like to get into. Can you put that last chart that you had back on the screen again, the very last one, or the one before it? [Chart deleted.]

Let us take that one. I guess a criticism that I have of we who are in the political spectrum and possibly to some extent of you in the military, is the fact that I am not sure the people of the United States

understand we should not expect that we are going to have a peaceful world. If there is going to come about a treaty, for us to have a preemptive strike force, as you have in that first one on the left there [indicating], the Soviet Union is not going to accept that.

Let me see if I can get to the question this way: I see that one on the left where the United States is right there, would that be about the same ratio that we had in 1961 and 1962 when Americans talked about President Kennedy's facing down the Soviet Union over Cuba? I have always had the impression—and I wasn't here then—but I have always had the impression that at that time we were so far superior that the Soviets dared not get into an ICBM confrontation with us. Was that about the ratio in 1960?

General BURKE. No, sir. But the total balance was so drastically different in 1960, as we talked about earlier, we are no better than about equal with present forces. In 1962, at the time of the Cuban missile crisis, probably you could have gotten an argument whether we were 20 times as strong or 30 times as strong, but even so we did not have what I would call a good preemptive first strike. We just had a whole lot more force but we did not have ICBM's of such accuracy that they could attack the Soviet silos in an effective way in 1960.

U.S. PREEMPTIVE FORCE

Senator EXON. Can you answer my question? Getting back to that bar graph there, "U.S. Preemptive Force," if you were projecting that chart in 1960, that blue line would have been way up to the top; is that right? It is just a rule of thumb.

General BURKE. If you had started with this proposition in 1960, the United States would have been here and the Soviet Union would have been in here [indicating].

Senator EXON. I wasn't picking hairs; I was just trying to get some basis to work from.

Now, that leads into my next question. I think we are all hopeful that sometime in the not too distant future, the next year or 2 years or 3 years from now, we might be able to negotiate a successful treaty of some kind with the Soviet Union, either on ICBM's or maybe even broader than that, but just take ICBM's for the moment.

Assuming 2 years from now, General, we were about to sign a SALT III, or since SALT is a bad name in some quarters maybe we should say just a new ICBM treaty, with the Soviet Union, certainly a key part of that would be not only what they have in place or building, but likewise it has to be also somewhat balanced.

The MX, as you have pointed out, is a very critical thing to our future as far as our protection is concerned. Now, the MX missile program that you showed us a while ago, that would cost an estimated \$26 billion and could escalate to \$56 billion because of inflation. I assume that is the total concept program that you have envisioned with variations as you come up with any ideas.

Have you planned in the phased construction approach that you have here, have you designed it so that if 2 years from now or 3 years or 4 years from now we come to some kind of a treaty with the Soviet Union, is the construction so planned that we could stop? We could

stop any time, but I am wondering if built into your planned construction are you considering the possibility that the MX program might be stopped somewhere along the line as a result of the treaty?

General BURKE. It is being built in a manner that you can extract the maximum effectiveness out of each increment. What that then would mean is that if the program were truncated at some point, what you have got is a workable, effective system, and you haven't built something over here and they are not connected. We would not build it that way. So we would be prepared, anywhere between now and 1989.

Senator EXON. Is it built in increments like 10 percent or 20 percent or 50 percent?

General BURKE. You sort of build it a valley at a time, but you start out from your main base and you do a nearby valley and you connect it.

Senator EXON. And if we signed it 2 years from now, we might have one valley, and if we signed it 2 years from now, we might have two or three, and in 5 years it might be five or six?

General BURKE. Yes.

Senator EXON. Thank you. I have no further questions. Thank you, gentlemen, for answering the questions.

General BURKE. It is nice seeing you, sir.

Senator QUAYLE [presiding]. What is the schedule for full operation of the MX which is indicated in 1986?

General BURKE. That is the initial operation. The full capability of the system is 1989.

Senator QUAYLE. But the first target date of any kind of operation would be in 1986?

General BURKE. That is correct, and that is 10 missiles and 230 shelters, in July 1986; the final projection, 200 missiles and 4,600 shelters in 1989.

MX REVIEW BY SECRETARY OF DEFENSE

Senator QUAYLE. What impact will the decision that the Secretary of Defense has made to review other options have on this?

General BURKE. The Secretary of Defense accompanied his request for further review with a very clear statement that he didn't want anything to impact on the current work in progress, and we are proceeding with that.

Senator QUAYLE. Dr. Zeiberg, are you the one who is going to make that review and present the options to the Secretary of Defense?

Dr. ZEIBERG. The review will be done by the Secretary and a panel of outside consultants with the right credentials. I am organizing the material now in preparation for his review and their review. I won't be in the direct line of making any final judgment for fear of having the fox in the chicken coop, because I have been such an integral part of the program myself.

The new faces in the administration will be involved with that decision, as well as a panel of very distinguished consultants.

Senator QUAYLE. When will this panel be selected?

Dr. ZEIBERG. It is in process right now. The Secretary will disclose that very shortly to the Congress and to the public. He is working on that literally today; selecting from a list of names, putting a schedule together, and framing the questions properly.

I hope that within a week he will be ready to talk with you and describe it in some more detail.

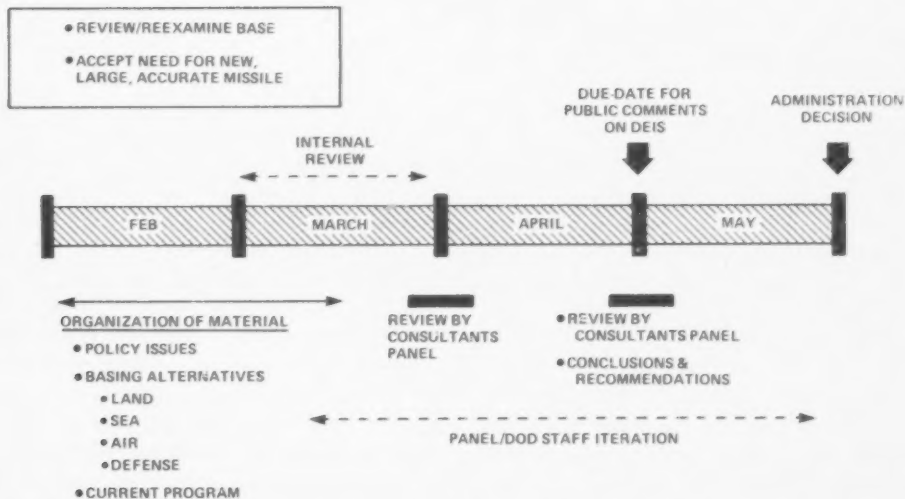
Senator QUAYLE. Did you recommend to him to pursue this, rather than reviewing all of the options before making a final decision?

Dr. ZEIBERG. In a sense I felt that before he could make a decision he would have to feel comfortable with the trail that led to the current program. He and other people who have come into the administration should have familiarity with how we got to the point where we are now. It is my personal opinion that the facts pointed to the present program being the proper one to pursue. I hope that by disclosing this in the proper format and having discussions with all of the new faces, that they will draw the same conclusion.

Senator QUAYLE. Do we have a time schedule on making an affirmative decision after reviewing all available options?

MX BASING REVIEW

— DRAFT PLAN —



Dr. ZEIBERG. Yes; let me put a chart back up. We are to do some internal reviews, bring in a panel of consultants, and then get public reaction to the draft of the environmental impact statement. If any delays occur, this review schedule would slip accordingly; however, we are continuing the MX program at full pace while this is going on. The Air Force is pursuing everything at full speed. We are in the process of organizing this consultant activity. The review has been going on for 2 or 3 weeks. It is an accumulation of existing data, but

put in a format that will make it easy for the new faces in the Pentagon and the external consultants to accomplish their review.

Senator QUAYLE. Do we have any plans to modernize the Titan and Minuteman forces?

MODERNIZATION OF MINUTEMAN AND TITAN

General BURKE. A very modest modernization effort to those two forces, Senator Quayle. We are equipping 300 of our Minuteman III's, our newest missile with an updated warhead, reentry vehicle, and that work is about half completed and will be completed by 1983. We are providing improved communications and updated communications to both Minuteman and to the Titan.

Additionally, to the Titan, we have a continuing program of effort to enhance the safety features of that vehicle.

We have had some unfortunate happenings with two of those missiles and we are doing all in our power to make sure we don't have a recurrence of that.

Senator QUAYLE. I understand there are 30 or 35 different systems that we had a chance to select from. What came in second?

General BURKE. Second would be some other form of MPS; and I think third would be some other form of MPS; a probable fourth and fifth would be some other form.

Senator QUAYLE. You are sold on MPS?

General BURKE. I think so. I think the facts and logic drive you to MPS, and then the arguments there are for more engineering detail and, second, how hard you can make a vertical versus a horizontal, and how much protection you need.

VARIOUS OTHER SYSTEMS

To go outside of that family, really there didn't seem to be a clear second choice. You have very fragmented groups who oppose this system, but with widely different reasons. You have a few people who will say, "Let us go to launch on warning, and we will just put the biggest missile in the silo we can, and if the Russians blink, we are going to shoot." But not very many people would agree to that.

Some other people say just give up ICBM's and just put more in submarines and more into bombers. But most people would say that that is a very wrong decision, on two points; one is that we are giving up valued military capability and, two, in abandoning a force that we had heretofore valued and in the face of an obvious Soviet threat to that force, we are committing what has to be viewed as a submissive act. They threatened something and we gave it up; friend and foe alike would consider that submissive.

I think the political consequences of that would be enormous. There are a few people who hold out to put them on trucks and run them up the interstate. Most people think that would run into insurmountable political problems. You would wind up pulling those back into garrison and if you did that, they would be critically depending upon some form of strategic warning, and that creates a very undesirable condition. History is not very encouraging in regard to our properly assessing the strategic warnings we have had in the past.

Then there are some who say it is all a myth anyway, that there are technical uncertainties of firing over the polar regions, we can't be sure of our missiles and the Soviet missiles would impact with such accuracy to destroy our silos, so we should just ignore the whole thing.

You can find 10 or 12 people who can support any one of those propositions, but there is nothing approaching a consensus for any of these.

Dr. ZEIBERG. Could I add something to that?

We submitted five options to President Carter in about May of 1979. One was to do nothing, one was to go ahead with MPS, and the other three variants that were seriously proposed were mobile. The first mobile variant was road mobile. It was rejected for the reasons of strategic warning. There was an air mobile variant that was rejected for cost reasons as well as the fact it had the same vulnerabilities that a bomber force had. Finally there was an option to accelerate the cruise missile program, build more cruise missile carriers, and at the same time accelerate the Trident program and build more submarines and a new, large sea-based missile. It was called an enhanced Triad.

Those were the five options debated for some time in the National Security Council. All of the shortcomings that General Burke mentioned led to the decision that MPS was the right answer. At that point there were SALT issues that clouded some of the technical features so we spent another 5 or so months adapting the MPS so that it had the SALT verification features that were desired by the State Department. Ultimately we settled on the basing mode described earlier.

Regarding the 30 options, there might be more than 35. These are concepts that have been explored since about 1967 when it first became apparent that the Soviets were headed toward a countermissile capability with their ICBM force. They deployed something called the SS-9 which we learned, in short order, was aimed at destroying our Minuteman force. At that point in time a great effort was mounted, is still going on, to develop more survivable basing modes for our ICBM force.

So, during those years about 35 concepts were explored seriously. Many fell by the wayside for various reasons. We can provide you with that background if you are interested.

Senator QUAYLE. Let me take the one of enhanced Triad. Was that rejected basically for the legs, you are doing away with the Triad and, second, this would be perceived as an act of submission?

Dr. ZEIBERG. Exactly. Those were the precise words. It was considered an act of submissiveness to react in this manner to the clear danger that the Soviets had spent time and money generating.

In connection with the Triad perspective, we adopted a Triad because of conservatism and nothing has occurred since that initial policy decision which would lead us away from a Triad. In fact, it is quite the opposite; the Soviets have built an enormous air defense that has a chance of getting a bomber force, and they have billions of dollars invested. I think their annual operating costs were about [deleted]. They have an enormous ASW R. & D. program; however, I do not think they are getting anywhere near a significant threat to our strategic submarines.

So all the actions of the last two decades ratify the concept of spreading assets out as much as we can and thereby diluting the Soviet countermeasures.

Senator QUAYLE. You bring up that it is an act of submission if we accept potential ICBM vulnerability, at the same time I was impressed by your argument as to why the U.S.S.R. won't accelerate their deployment of their ICBM's that would make us expand our land-based missiles. Wouldn't they think that accepting MX is an act of submission?

It seems to be maybe a little contradictory, particularly if they feel they have us right now on the ICBM force and force us in this direction, that once we go in that direction they wouldn't continue to do something to make that again more vulnerable, since that has been their strategy in the past.

Although it was a convincing argument that they won't do it, but if they do do it, it does raise some questions.

General BURKE. Well, if they do it, it will be because we allowed them to do it. The United States, you know, has twice the wealth of the Soviet Union. We are the more inventive people, and our technology is superior to that of the Soviet Union. As I often point out as I go through this, the basic purpose of the MX or MPS system is to present the Soviets with an unfavorable exchange ratio. We are officially scared now because the Soviets can kill up to three of our Minuteman warheads with one or two of their warheads.

The logic of MPS is to turn that arithmetic around.

Now, at most, if you are successful in hiding it, they use 2.3 warheads for every one they destroy. That is what military people call an unfavorable exchange ratio; that is a good result but it is also insufficient.

Granted, you cannot win a war by expecting an unfavorable exchange ratio. Even though you have a desirable exchange ratio, will lose if you have let yourself get so far behind in the balance that you can still be overwhelmed. Even though the ratio is against the attacker you lose. We don't have to accept that inferior position. Indeed, it has been our policy for a long time that we will not accept that position.

Dr. ZEIBERG. Let me add a point. By deploying the MPS system, we make provision to provide a similarly operated defense system which preferentially defends only the single missile. That compounds the leverage we get. So the basic structure we get by having an MPS system provides us two degrees of response to what the Soviets do. Therefore, we put them in a position of getting marginal returns from any further investment they make in their ICBM system. For similar reasons, the efforts we made makes theirs a hopeless attack.

Senator EXON. I have a last question, gentlemen, which has been concerning me for sometime, and we haven't any recent testimony that I can remember.

Our counterstrike force is based on the Triad, of course, and particularly the whole Triad, but let us zero in on the ICBM's. It is based on the theory that higher authority, once they know of a strike or a possible strike by the Soviet Union, communicates instructions. I suppose there would be an alert that would go out first if they can follow that scenario, and then after the final determination has been made by the President and you people, you would send through various types of communications the order to launch.

COMMUNICATIONS AN IMPORTANT LINK

Now, therefore, communications become a critically important link. What can you tell us about the protection we need for that communications systems? To our knowledge, does the Soviet Union have any kind of an early strike that would cripple our communications to the point that higher authority would not be able to communicate to the MX, the Minuteman or our other retaliatory forces?

General ALLEN. In all scenarios where it is necessary to execute the force, and that is to give the force the instructions to strike, following substantial nuclear attack that has been aimed at communications, there is a great deal of concern. It is a serious matter and a difficult one. [Deleted.]

So a great deal of attention has been given to that question. There are still substantial improvements that we need to make in this area.

AIRBORNE COMMUNICATIONS SYSTEM

There is a lot of redundancy, and there are a lot of different modes of communications, but I might call your attention to two aspects of it on which we rely very heavily. The first of those is the airborne communications system, which is a good coupling between the National Command Authority, however it exists, and particularly the ICBM's, where it is very tight, but also in lesser tightness to the bombers. It is important to maintain that link. It is why we keep a command post airborne continuously and it is why the National Emergency Command Post is retained in a quick-reaction ground alert status.

We do rely on that system and we have a good deal of confidence in it.

Now, a second element of the communications system which adds assurance to the communications from this airborne network to the bombers is the emergency rocket communications system through which our Minuteman would carry transmitters instead of warheads as payloads. They would go up very high and provide broadcasts instructions to the bombers and insure connectivity with the NCA.

Both the airborne links and the rocket links are very survivable. We have a good deal of confidence of those working well through an exchange, and they are the answers [deleted].

Again, as you put these things together, it is why we say one of the particularly important features of the land-based ICBM is the tight command/control that is available for them. That depends upon the airborne communications system, but it is not so dependent upon the rocket communications, and it is easier than the submarine question.

Senator EXON. General, is there a plan that is feasible for us to have a further backup system with some of the satellites, either commercial or otherwise? Do we have any system like that?

AIR FORCE SATELLITE COMMUNICATIONS SYSTEM

General ALLEN. Yes, sir, there is such a system. The present version is the Air Force Satellite Communications System, which is actually a special transmitter, a transponder, that is attached to other satellites.

It is used for a relay of the emergency action messages. We have had under development and consideration for sometime a special survivable satellite system and the status of that has been under approval for awhile.

Senator EXON. What is that?

General ALLEN. It is on approval at the present time. We have a system which I outlined, and the future of that is in doubt. We have had proposals that have been submitted to Congress in the past for a survivable strategic satellite system. That has not fared well, for various reasons, either in our own reviews or congressional review, so we currently have a good satellite relay package, but we still have some questions to answer about what we will do in future years.

Senator EXON. How about land communications, the telephone and cable and those kinds of things, undoubtedly from what we now know, could the Soviet Union disable our communications networks that are based on land?

LAND-BASED COMMUNICATIONS NOT RELIABLE

General ALLEN. Yes; if I could review it just for a second. In previous years, the way we obtained great confidence in the linking of strategic forces was through the great redundancy of the Bell Telephone System. We had many leased lines, specially protected lines, and a great deal of path restorability which we believed would give us a good deal of resiliency. There have been scientific investigations in recent years which have pointed out that that system has unfortunately had technological improvements which have not been to our favor; that is, they have created switching nodes which are subject to nuclear attack. For those reasons in recent years we have not placed the same reliance in the land lines and microwave cable kind of links that we did in previous years, and we have placed higher emphasis on the airborne line-of-sight communication links.

Senator EXON. Thank you.

Senator QUAYLE. I have no further questions. I think it is close to noon.

Thank you for a very fine presentation, and as Chairman Warner said, the record will be kept open until 5 p.m. this afternoon.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

PRODUCTION OF MK12A REENTRY VEHICLES

Senator WARNER. What is the current program for production of the Mark 12A warhead? Does the current program envision a hiatus in production following completion of the planned buy of Mark 12A warheads for the 300 Minuteman IIIs now designated for upgrading, and prior to production for the MX?

Dr. ZEIBERG. The current program calls for production of 1,083 MK12A reentry vehicles, or enough to equip 300 Minuteman IIIs plus spares and flight test assets. If no changes are made, the contractor (General Electric Company) has stated there will, indeed, be a hiatus, or production gap, of 30 months for GE and many of its vendors. We are currently examining the many issues that are relevant to a DOD decision to avoid such a production gap.

General ALLEN. The current MK-12A program procures 1,083 reentry vehicles to support deployment on 300 Minuteman III missiles. This number includes operational, spare, and test assets, with the final units scheduled for delivery in 1983. Production of MK-12As for MX is programmed to achieve a full rate of production in 1985. These schedules represented a gap of about 30 months between the full rates of production for the two programs. In the interim, a few MK-12As will be produced to support the MX development flight test program.

COST OF MK12A PRODUCTION GAP

Senator WARNER. What are expected to be the associated costs of interrupting production activity (of the MK12A)? Will there be difficulties experienced in maintaining a qualified production capability, that is, certified contractors and tooling-up facilities?

Dr. ZEIBERG. We are still examining this question and definitive answers are not yet available. Informal estimates of the cost impact of a production gap have ranged from \$85 to \$200 million. Any restart of a complex production capability can involve the difficulties you mention, which result in higher unit costs due, in part, to starting higher up on the learning curve.

General ALLEN. We estimate that continuing the MK-12A production line, albeit at a low rate, between the end of the Minuteman III buy and the beginning of full rate production for MX could save up to \$75 million for the total MK-12A buy for MX. These savings could accrue by avoidance of production restart costs such as material and piece part qualification. Attainment of maximum savings assumes there is no interruption in the production line. Therefore initial funding would be required in April 1981, the time that the first material vendors complete their planned deliveries for the current buy.

There are several other matters which have a bearing on continuing MK-12A production at this time. These include the role that the Advanced Ballistic Reentry Vehicle may have for MX; the incomplete definition of the MK-12A arming and fuzing subsystem for the MX application; and the lack of production authority for MX, pending a DSARC III decision.

We know of no reasons at this time that lead us to anticipate major difficulties in restarting MK-12A production as planned for MX.

REQUIREMENTS FOR MORE MK-12A'S

Senator WARNER. Has the Strategic Air Command established a requirement for equipping an additional 200 MM III's with Mark 12A's? Where does planning for meeting such a requirement stand at this time?

Dr. ZEIBERG. No such requirement has been documented at this time, although I know the question is being actively pursued. SAC has been asked for its written position on this question. Even in the absence of a requirement, the Air Force is developing some relevant planning and impact data; but there is nothing definitive available at this time.

General ALLEN. Although there are no present plans to deploy additional MK-12A's, the Strategic Air Command has proposed [deleted]. This proposal will be considered in the formulation of our fiscal year 1983 budget request.

PROGRAM IMPLICATIONS OF MORE MK-12A'S

Senator WARNER. To what degree could increased production of Mark 12A's to accommodate additional MM III retrofitting be used to maintain a rational, cost-effective production rate for these reentry vehicles? At what level would such production be envisioned? Would nuclear materials needed for the Mark 12A warheads be available to support such levels of production? What would be the associated costs in fiscal year 1981 and fiscal year 1982 required to support such an expanded program?

Dr. ZEIBERG. The Air Force is preparing answers to these and other questions, with inputs from the Department of Energy; but there is no definitive information available at this time.

General ALLEN. Deployment of MK-12A reentry vehicles on an additional [deleted] Minuteman IIIs would require acquisition of about [deleted] additional units, to include operational, spare, and test assets. If the intent of this

acquisition was to fill the 30-month gap between production runs for Minuteman and MX, this would lead to a production rate of about [deleted] units per month. The sole source MK-12A contractor has advised that the minimum, sustainable production rate is about 20 units per month if we are to realize production efficiencies and, therefore, significant savings to the MX program.

The Department of Energy has advised that [deleted]. This is due to their [deleted]. They further advised that [deleted].

The fiscal years 1981 and 1982 costs to support continued procurement of MK-12A reentry vehicles would be about \$9.9 million and \$116.6 million, respectively, exclusive of DOE costs.

REDUCING COSTS OF MX CONSTRUCTION

Senator WARNER. What alternative designs are under consideration to further reduce the costs of the Multiple Protection Shelter horizontal basing scheme? Is there a proposal now under consideration which would eliminate the concrete/steel shelter design in favor of an all-steel shelter?

What are believed to be the relative costs and operational characteristics of the concrete versus the steel shelters? Would adoption of such an alternative structure design result in significant cost savings over the life of the MX program? Could steel shelters be substituted for concrete/steel structures without imposing any further delay on the MX IOC?

Dr. ZEIBERG. We have a very aggressive program to test, in parallel, two novel approaches to construction of reinforced concrete shelters. Actual construction tests will start in May and be completed next February. Shelter designs will be modified as necessary to optimize for these new techniques if they prove out. The overall objective is to reduce both costs and the size of the construction labor force. We are giving some consideration to a proposal to use all-steel construction instead of reinforcing concrete. The proposal was found, by three different design groups which evaluated it for us, to have some major deficiencies in meeting the nuclear hardness requirement. Because of the significant advantages in using steel if it can be made workable, we are still trying, in cooperation with the steel industry, to come up with a satisfactory design. I will have to say, however, that at this time I am not too optimistic.

The steel design originally suggested to us would have cost on the order of twice as much as concrete if modified to meet the nuclear hardness requirements. As I have stated, we are working to refine that to try to produce a design that is cost-competitive. There would be no significant difference in operational characteristics. I would also expect no significant difference in cost after the shelters are built. There might be some delay, but this would depend largely on what the steel design looked like and how much development testing was required. High explosive tests to verify hardness would probably be the pacing item. It might be practical to build the first shelters in concrete and later ones in steel.

General ALLEN. We are testing two approaches to construction of reinforced concrete shelters, the overall objective of which is to reduce both shelter costs and the size of the construction labor force. We are also giving some consideration to a proposal for all-steel construction instead of reinforced concrete. The initial U.S. Steel shelter design, though cheaper than concrete, did not meet survivability requirements.

Efforts to produce a survivable steel design are continuing. Determination will then have to be made whether preliminary tests and cost estimates warrant further development. Depending on the availability of an additional \$2.5 million for extensive fiscal year 1981/82 field testing, a mid-fiscal year 1982 decision for either concrete or all-steel would not adversely affect the MX IOC.

RELATIVE ENVIRONMENTAL IMPACTS OF CONCRETE VERSUS STEEL

Senator WARNER. What are the relative environmental impacts of concrete/steel versus steel shelters thought to be?

Dr. ZEIBERG. Steel shelters would probably have substantially less environmental impact because field labor and construction machinery would be reduced. That is the main reason we are still trying to work out a viable design in steel.

General ALLEN. Steel shelters may have less environmental impact due to centralized fabrication and minimum field labor. The environmental differences, as well as performance and cost characteristics of the concrete-rebar/all-steel designs, are presently under study by the Air Force, Defense Nuclear Agency, and U.S. Steel.

MAINTAIN POSITION LOCATION UNCERTAINTY

Senator WARNER. General Allen, in your statement you say "the risks are low, the technology seems well in hand." You also say that "we understand the system technically and militarily—we know how to build it efficiently and we know that it will be effective."

General ALLEN. MX critics suggest that it will be difficult to keep the location of the MX missiles unknown. Why are you so confident that so-called "position location uncertainty" (PLU) can be maintained?

General ALLEN. Our confidence in MX PLU stems from the inherent flexibility of the basing concept; the foreseeable state-of-the-art in sensor design; and the coordinated efforts of the Air Force, industry, scientists, the FBI, CIA, and local law enforcement authorities. We are developing elaborate system of "checks and balances" to monitor location uncertainty continuously. By compartmentalizing information, designing flexible threat responses and continually evaluating technical/operational aspects of the system, we are confident we can maintain highly-confident PLU.

The MX MPS basing mode is the result of almost two decades of careful study and engineering. The Air Force has retained the counsel of the nation's most respected senior scientists and intelligence organizations to continually monitor both the status and future of PLU requirements. It is a system which is flexible and will change to meet a changing threat.

HIGH TECHNOLOGICAL RISK IN SHELTER CONSTRUCTION

Senator WARNER. General Allen, some critics have suggested that there is high technological risk in the construction of horizontal shelters because of uncertain hardness. What is your opinion?

General ALLEN. The horizontal shelter is a low-risk, high confidence design. It is designed for survivability at lowest overall cost and ease of operations and maintenance. The Defense Nuclear Agency has reviewed the Air Force design and judged that a 600 psi horizontal shelter structure can be designed to withstand blast and shock effects with high confidence based on existing simulation test experience and analysis. Additionally, the Air Force has an extensive explosive field test series underway. Recent test results have reinforced the confidence we have in the present horizontal design.

CONFIDENCE IN COST ESTIMATES

Senator WARNER. General Allen, how confident are you that cost estimates for the MX system in real terms will not be greatly exceeded?

General ALLEN. We believe that our cost estimates are accurate, given the development stage of the program. As the MX program proceeds, we will be refining our estimates to account for technical innovations, revised requirements and, in some cases, unforeseen circumstances. These are normal adjustments, both upward and downward, which are to be expected in an endeavor of this size.

TENUOUS PARITY

Senator WARNER. General Allen, in your statement you say that "at present we find ourselves in the position of tenuous parity and given superior momentum of Soviet strategic arms programs, our position will deteriorate further over the next few years before we are able to turn it around."

General ALLEN. If we do not proceed with the MX program and a survivable basing mode, do you believe that we will lose our "tenuous parity" and that the Soviet Union might achieve a "clear cut" nuclear superiority?

General ALLEN. Yes. We must proceed with the deployment of all our currently programmed forces—MX, ALCM, and Trident—along with a new manned bomber if we are to reserve adverse trends in the strategic balance and avoid the ominous prospect of substantial U.S. strategic inferiority. Key to restoring Triad strength and the strategic balance is the deployment of a survivable, land-based ICBM. The MX deployed in multiple protective shelters not only will provide for survivability of the ICBM force, but will do so in a manner that preserves the military characteristics which give ICBMs their value. Failure to deploy MX in a survivable basing mode would send the wrong signal to adversaries and friends alike.

MAINTAIN POINTS

Senator WARNER. General Allen, under what circumstances could the United States maintain parity without survivable ICBMs?

General ALLEN. I don't believe we can continue to maintain parity with the Soviet Union without survivable ICBMs. We have carefully structured our strategic forces to provide a strong Triad of land-based missiles, submarine-launched missiles, and long-range bombers. These components enhance and build upon each other's strengths, and compensate for each other's weaknesses. To abandon our land-based ICBMs would seriously weaken the strategic deterrent provided by the Triad and would concede a very significant military advantage to the Soviets.

IMPROVED CAPABILITIES OF MX NECESSARY

Senator WARNER. General Allen, do you believe the improved capabilities of the MX missile are necessary along with the survivability to maintain strategic parity?

General ALLEN. Yes. The MX program is essential for ICBM survivability and improved capabilities. It represents our top programmatic priority. MX provides the unique characteristics of the land based ICBM as well as increased throw-weight and number of warheads which will increase the utility of each surviving missile. In addition, the improved accuracy will provide a more effective ICBM against the full range of targets, including hardened military installations.

The growing vulnerability of our Minuteman and Titan ICBM forces to the increased number and improved accuracy of Soviet warheads necessitates that we deploy the MX missile in multiple protective shelters without delay. Moreover, the MX, based in a highly survivable basing mode, will provide us with flexible retaliatory capabilities consistent with our countervailing strategy.

While our efforts to harden Minuteman silos would improve their survivability to some extent, they would not degrade the improvements in Soviet warhead delivery accuracy that are expected to occur in the mid-1980s due to the extensive and intensive Soviet research and development programs that we have been witnessing. As a response to these ominous developments, the deployment of the MX will halt the adverse trend in Soviet hard target kill potential and stabilize this aspect of the strategic balance near parity. The MX will also demonstrate our resolve to maintain a credible strategic deterrent.

OSD REVIEW OF MX BASING

Senator WARNER. Dr. Zeiberg, Defense Secretary Weinberger has indicated that the Reagan administration will conduct a review of MX basing and will protect the planned IOC of MX during that review. Will you explain to the committee the scope of the Reagan review and your role in that study?

Dr. ZEIBERG. We are proceeding with a vigorous and thorough review of MX basing options and will make a final decision by July 1. While conducting this review, we will continue to pursue the baseline MX program. A final judgment by July 1 will permit a thorough technical and policy review, yet maintain the current program schedule. This timing also enables us to consider adequately public comments on the MX draft environmental impact statement.

At the request of the DepSecDef, my role is that of the OSD chairman charged with organizing and completing this internal review.

OSD REVIEW OF SEA BASED CONCEPTS

Senator WARNER. Dr. Zeiberg, what sea based systems will be included in that review?

Dr. ZEIBERG. As part of the review group, the Navy is looking at surface ship basing, the concept known as SUM, or shallow underwater missile, and accelerated Trident II and/or more Trident I backfits.

OSD REVIEW OF MX DEFENSE

Senator WARNER. Dr. Zeiberg, will strategic defense systems be included in the study?

Dr. ZEIBERG. Yes, we are looking at ballistic missile defense in three contexts: MX/MPS, Minuteman or MX in Minuteman silos, and the launch under attack option, using either Minuteman or MX.

EIS PROBLEMS ON MX

Senator WARNER. General Allen, you report that "The draft EIS to support deployment area selection is public and it indicates that the various ecological, economic, and social impacts while significant are manageable. We have had a promising find of water at the preferred base location near Coyote Springs in southern Nevada."

Many MX critics have suggested that there is inadequate water and inadequate concrete in the Great Basin for the MX program. Why are you confident that these problems can be overcome?

General ALLEN. Water and concrete should not be a limiting factor in the MX deployment.

Our water resource program has yielded encouraging results. Our literature surveys, field work, and the range of alternative water sources make me cautiously optimistic. In addition, a recent Utah Water Resources Division study has indicated that there is ample water for MX and all proposed energy developments without cutting into present agricultural supplies.

Cement demand for MX is estimated to be only two percent of the projected production capacity in the 11 western states that constitute the regional market area. We plan to purchase centrally and stockpile cement prior to the peak construction period. Advance procurement and storage will reduce surges in demand and also help stabilize prices.

SIGNIFICANCE OF EIS IMPORTS/MANAGEMENT

Senator WARNER. General Allen, you admit that ecological, economic and social impacts are significant but maintain that they are manageable. How significant are they, and how do you intend to manage them?

General ALLEN. As with any large construction project in sparsely populated areas, there will be substantial growth in certain communities within the deployment area(s). The major social and economic impacts will occur during the construction phase due to the influx of construction workers and support personnel. Of course, the significance of impact associated with MX construction and deployment will depend on the steps we take to reduce such effects. Our planning is directed toward reducing impacts to the extent possible.

We have, for example, already implemented the "mitigation-by-avoidance technique" by avoiding sensitive and potentially high economic value lands in our planning. To reduce the influx of workers, we plan to hire as many construction workers from local areas as possible. Other efforts include identification of impacts and potential mitigations through the National Environmental Protection Act process. We will also continue to participate with intergovernmental working groups to anticipate and resolve concerns, provide technical planning assistance and develop alternative financial means to help communities adjust to MX. Other important measures include establishing monitoring programs to evaluate the accuracy of impact predictions, identify new mitigation requirements and ensure implementation of mitigations planned.

MX AND SIOP

Senator WARNER. Last week General Ellis, the SAC Commander, briefed this committee on the projected military balance over the next ten years. He used a model which has been praised as being perhaps the best because it uses real operational considerations for both the U.S. and the Soviets. His studies clearly show the value of MX both for survivability and for reducing Soviet forces to be immense.

General Allen, if you never get MX deployed in a survivable mode, what does that do to the military balance and what could you do instead?

General ALLEN. Because of the increasing vulnerability of existing ICBMs, a survivable land based ICBM is urgently needed to regain full Triad strength. MX deployed in the multiple protective shelter basing mode will provide that survivability. If the MX is not deployed in a survivable basing mode the military balance will deteriorate further in favor of the Soviets.

After studying the problem of ICBM survivability for almost 20 years and considering more than 35 different basing modes, we know no basing mode that would be as effective as MX in multiple protective shelters and still would retain the unique characteristics provided in land-based ICBMs.

MILITARY BALANCE WITHOUT MX

Senator WARNER. General Burke and Dr. Zeiberg, if you never get MX deployed in a survivable mode, what does that do to the military balance and what could you do instead?

Dr. ZEIBERG. It is my view at this time that the military balance without MX or an alternative yet to be defined would be shifted sharply against us, jeopardizing stability and our very security. As you know, we are currently reviewing the MX basing question within the Department; and the Secretary of Defense will overlay that review with an independent panel of distinguished people outside the Department. These efforts point to a Presidential decision by about 1 July, and I prefer to withhold further comment until that time.

RELATIVE COST OF MX

Senator WARNER. General Allen, you state that "MX and MPS, while expensive, are less so than many other alternatives and its expense is consistent with that of previous strategic programs."

For the record, could you tell this subcommittee what alternatives are cheaper than MX and MPS and why they were not selected?

General ALLEN. We investigated two alternatives that would be lower in cost than MX in MPS: deployment of MX missiles in current Minuteman silos and a road-mobile ICBM system. Deployment of MX in current silos was not selected because it did not solve the basic ICBM vulnerability problem. The road mobile concept was rejected because of its dependence on warning and, thus, low pre-launch survivability. Moreover, a road-mobile system would pose nuclear safety and physical security problems as well as arms control verification difficulties.

COMPARE MX COSTS WITH POLARIS, POSEIDON, AND MINUTEMAN

Senator WARNER. General Allen, could you for the record, contrast the cost of MX and MPS with the cost of earlier strategic programs such as Polaris, Poseidon, and Minuteman?

General ALLEN. The cost of MX compared to earlier strategic systems in constant year fiscal year 1980 dollars is as follows:

<i>Acquisition:</i>	<i>Billion</i>
MX	\$34.00
Minuteman	40.00
Trident	39.00
Polaris/Poseidon	40.00
<i>Operation and support (per year):</i>	
MX	.45
Minuteman	.30
Trident	1.00
Polaris/Poseidon	1. +

MX MINUTEMAN SILOS

Senator WARNER. General Allen, if the MX missile were built and deployed in existing Minuteman silos, that would be very costly also would it not?

General ALLEN. Yes, it would. The estimated cost of deploying 200 MX missiles in current Minuteman silos is roughly \$19 billion in fiscal year 1980 dollars. A 400-missile deployment would cost about \$24 billion, also in constant fiscal year 1980 dollars. The most important point, however, is that silo deployment of MX would not solve the ICBM vulnerability problem.

APPLY ALCOS PHASE III

Senator WARNER. Last year this committee reviewed several "quick fix" options related to the Minuteman ICBMs, General Allen, could you supply for the record your views on applying the ALCOS Phase III launch control system to additional or all Minuteman ICBMs?

General ALLEN. Airborne Launch Control System (ALCS) Phase III is an important part of our program to make timely qualitative improvements to our Minuteman force. The ALCOS Phase III will provide the National Command Authority with increased flexibility in retargeting surviving Minuteman IIIs. The fiscal year 1982 budget request includes funds which will permit us to proceed

with the ALCS, Phase III program for 200 Minuteman III missiles. Consideration of an expanded ALCS program will be based on requirement analysis and the availability of additional funds.

DEPLOYING/PRODUCING MORE MINUTEMAN MISSILES

Senator WARNER. Could you comment on the capability and advisability of deploying 50 or 100 additional Minuteman III missiles or producing more Minuteman missiles?

General ALLEN. I would not recommend deploying additional Minuteman IIIs in place of Minuteman IIs since this action would reduce Minuteman III test/spare assets to an unacceptably low level. Moreover, it is essential to recognize that this replacement program would do nothing to improve the survivability of our highly vulnerable silo-based ICBMs. This is the fundamental weakness of that force and the one that requires highest priority addressal.

While the production of more Minuteman missiles is feasible, it would cost about \$530 million just to reopen the production line, and a new Minuteman III production line would take five years to reach first qualified booster delivery.

PLACING MK-12A WARHEADS ON MINUTEMAN MISSILES

Senator WARNER. Could you comment on the advisability of placing MK-12A warheads on more Minuteman missiles than is now planned?

General ALLEN. Placing MK-12A warheads on more Minuteman missiles than is now planned would provide a modest increase in hard target kill capability. However, the MK-12A is heavier than the MK-12 and would impose some additional range and footprinting constraints. To a degree, these constraints could be accommodated through deployment and targeting decisions. With the initial production of MK-12A warheads for 300 Minuteman missiles nearing completion, we are currently reviewing the benefits that might be derived from a larger deployment.

TITAN II AND MINUTEMAN II MODERNIZATION PLANS

Senator WARNER. Our older ICBMs, the Titan II and the Minuteman II are suffering reliability problems due to their age. General Allen, what modernization plans exist for Titan II and Minuteman II?

General ALLEN. Planned Titan IIs include modification of the launch control equipment and numerous new safety features for Titan site as well as other reliability improvements including a rework of Titan engines, power supplies, electrical systems, hydraulic systems and complex security.

The Minuteman II is the subject of an extensive ground test/aging surveillance program. For example, reentry vehicle components and penetration aids undergo periodic evaluation, missile guidance and flight controls are subjected to vibration testing and electromagnetic pulse; and, rocket motors are static fired. Items critical to the hardness of the weapon system are monitored to insure no degradation in capability occurs. Degradations to system performance noted in the ground and flight test programs are being corrected. Other examples of modernization for Minuteman include a Minuteman II guidance set upgrade, modernization of the hardened intersite cable system, and replacement of environmental control system components.

MX IN TITAN II AND MINUTEMAN II SILOS

Senator WARNER. Is it possible to place MX missiles in Titan II silos or Minuteman II silos and, if so, what would be gained?

General ALLEN. It would be possible to deploy MX in all Titan II and 400 of the newest Minuteman silos at an estimated cost of approximately \$24 billion. However, deployment of MX missiles in existing silos would not ameliorate our growing ICBM vulnerability.

TITAN II SAFETY PROBLEMS

Senator WARNER. What are you doing to address safety problems associated with the Titan II missile?

General ALLEN. We have improved our safety practices and supervision by initiating better methods of tethering tools and equipment used in the launch duct, requiring work platforms at and below the level upon which maintenance

is being performed, and revising our technical manuals to clarify maintenance and operations safety procedures. We also require a qualified commissioned officer to be present when maintenance is under way in the launch duct.

Programs have also been initiated to develop and install improved hazard prevention, detection and warning systems. In addition, a new fixed vapor sensing system is being studied, and the existing system is being modified to ensure it can be maintained until a new system is in place. Equipment is also being procured which will remove vapors from silo exhaust shaft emissions should a propellant leak occur. Warning sirens are also being purchased for each Titan site.

Finally, we are continuing our review of additional safety modifications and methods.

MX SHELTER CONSTRUCTION TECHNIQUES

Senator WARNER. The Air Force has initiated a demonstration program testing a pre-cast or cast in place techniques to reduce costs of MX shelters. Fourteen shelters will be built during the program.

What kinds of cost savings are possible with these new construction techniques?

General ALLEN. There are probably cost savings in several areas. First, special construction equipment, which will reduce the on-site manpower requirement is under development to support each of the construction techniques. Second, through the demonstration program we will be able to determine the optimum sequencing of individual construction activities so that shelter construction time can be reduced. Third, the demonstration program, by providing better information on the time and resources to construct shelters, should promote more realistic contract bids and costs.

NEW CONSTRUCTION TECHNIQUES AFFECT HARDNESS

Senator WARNER. How will these next construction techniques affect the hardness of the shelters and other operational considerations?

General ALLEN. The design specifications for construction options such as cast in-place, slip-form, or precast, provide a solid protective structure able to meet the blast criteria. Each of these techniques has construction advantages and disadvantages relating to large-scale construction characteristics, manpower, and cost. We will address these issues in the MX protective shelter construction demonstration project now under way at the Mercury, Nevada, Engineering Test Bed.

NEW CONSTRUCTION TECHNIQUES REDUCE IMPACT

Senator WARNER. How might these new construction techniques reduce socio and economic impact on the West?

General ALLEN. The new automated construction techniques under consideration would require less on-site manpower than traditional techniques, thereby reducing the influx of construction workers into the sparsely populated deployment areas.

MX AND WATER

Senator WARNER. Over a period of eight years, MX construction will require at peak 30,000 acre feet of water and then will require 13,900 acre feet of water for steady State operation. This latter amount equals the water used by 12 golf courses in Las Vegas. By comparison, Las Vegas uses 115,000 acre feet of water per year, Reno uses 45,000 acre feet of water per year, and construction of the IPP project will use 45,000 acre feet.

General Allen, the western States have suffered a severe drought in this last year. How will that impact on your estimate of water availability in the Great Basin for MX.

General ALLEN. The drought is a matter of concern. Hopefully, it will be temporary. Recharge of the underground aquifer system will undoubtedly be reduced this year, but it will have storage capacity to satisfy local demand. Peak water requirements due to MX construction are not projected to occur until 1984 and beyond. Based on estimated storage capacities and an aquifer recharge rate that we hope will have returned to normal by that time, we do not expect water availability to be a problem. It is our policy to comply with all State water laws and we will make every attempt to minimize adverse impacts.

FACTORS CONSIDERED

Senator WARNER. Much of the concern over water relates to the fact that other new needs for water are materializing such as the IPP Power Project. How have these been taken into consideration in your studies of water availability?

General ALLEN. The water needs associated with the Intermountain Power Project (IPP) were specifically addressed in the draft environmental impact statement. We estimate that the average annual steady state requirement of MX would be less than one-third of that projected for the IPP. We have taken into account all known water demands, planned sources, locations, and timing to provide cumulative estimates of water requirements and availability for the MX and other future public and private projects.

MX AND CEMENT

Senator WARNER. MX will use less than one-half of one percent of the total annual U.S. production of cement. Most of that cement will come from those western States which are presently experiencing great population growth and much construction. How confident are you that you will be able to provide sufficient cement for the construction of MX/MPS shelters?

General ALLEN. We are extremely confident. MX cement demand is only 2 percent of the projected production capacity in the 11 western States that constitute the regional market area. We plan to purchase centrally and stockpile cement prior to the peak construction period. Advance procurement and storage will reduce surges in demand and also help stabilize prices.

REDUCE CEMENT NEEDED

Senator WARNER. What is being done to reduce the amount of cement which might be necessary for each MX shelter?

General ALLEN. Concrete mix designs are currently under investigation to determine the design which will result in minimum cement requirements. In addition, research is underway to minimize the shelter's interior space requirements. Both of these efforts are aimed at reducing the quantities of construction materials required for each shelter.

FUTURE OF ABRES

Senator WARNER. Funding for the Advanced Ballistic Reentry System (ABRES) program has been greatly reduced in recent years and suggests that this advanced ICBM program is headed toward termination. This would leave the U.S. without an advanced ICBM program. General Allen, what is the future of ABRES? Could the ABRES program be restructured so as to become a focal point of advanced ICBM concepts?

General ALLEN. While more immediate defense requirements have resulted in reduced funding for the ABRES program, we do not plan to terminate this program and, in fact are instructing our work to expand in the areas addressed.

We anticipate that our Strategic Missile Systems 2000 Study will identify the most promising ballistic concepts, technologies and areas of development. We would then budget for this strategic development work in a new program called Advanced Strategic Missile System which will incorporate ABRES work and these newly identified efforts.

PAST MX DESIGNS

Senator WARNER. General Allen, in your statement you say that "Over the years we have studied in considerable detail about 35 different designs and many variations on MX designs. The Air Force is confident that of all those studied the present concept of horizontal multiple protective structures is the best possible solution to a many dimensioned and difficult problem." In your personal view, is the present MX basing design significantly better than the approximately 30 other designs considered?

General ALLEN. Yes, it is the most effective basing mode we have found to preserve those unique ICBM characteristics—independence from warning; high reliability; high alert rates; low operating costs, secure C³; and accurate, effective weapons delivery—which give the strategic Triad its diversity and re-

silence. MX deployed in a multiple protective shelters basing mode best combines the qualities of survivability, effectiveness, affordability and consistency with arms control goals.

MOST ATTRACTIVE CHARACTERISTICS

Senator WARNER. General Allen, what characteristics of the preferred Air Force basing do you find most attractive?

General ALLEN. The most attractive features of the multiple protective shelter (MPS) basing mode include:

High survivability achieved without reliance on strategic or tactical warning. In contrast, without strategic warning we would expect to lose most of the non-alert bombers and SLBMs and without tactical warning even the alert bombers could be lost.

The MX in MPS would not be vulnerable to the same type of attack which threatens other components of the Triad. The main threat to silo-based ICBMs is an adversary's ICBMs, whereas bomber fields and submarine bases are more susceptible to the short warning SLBM attack. The timing required to attempt destruction of the TRIAD confronts an adversary with virtually insurmountable targeting problems.

Ability to ride out an attack or to endure in a manner which permits MX to be employed rapidly, precisely, and flexibly, or to be withheld with confidence that they can be used later.

The ability to move missiles/launchers between shelters quickly. This rapid mobility feature is unique to horizontal MPS and would give us an added dimension in maintaining concealment which would further complicate any attempt to undermine the security of the system.

PREFERENCE FOR HORIZONTAL SHELTERS

Senator WARNER. General Allen, in 1978 the Air Force recommended deploying MX in vertical MPS shelters. What are the military reasons you now prefer the horizontal shelters?

General ALLEN. By adding mobility features to the concealment mode, the horizontal MPS system provides increased confidence in survivability. Should we suspect that concealment has somehow been compromised, (or, if we simply wish to add to our confidence that the Soviets could not know the missile locations), this mobility will allow us to relocate all missiles in about 12 hours compared to about two days with the vertical system. If concealment remained in question for some period, or in times of heightened tension, we could place a portion of the missile force in motion within the missile fields, planning to dash to the nearest shelters upon receipt of tactical warning. This could be accomplished in less than missile flight times with the horizontal, but not the vertical system.

VERTICAL SHELTER SYSTEM WORK

Senator WARNER. General Allen, do you personally believe the vertical shelter system would have worked?

General ALLEN. Yes. Vertical MPS basing is a feasible alternative. Its cost would be slightly less than the horizontal basing mode, but it would lack the extra dimension of mobility provided by the horizontal mode. Furthermore, shifting to the vertical mode at this point in time would delay MX IOC by 6-12 months.

SIZE OF THREAT COUNTERED BY MX

Senator WARNER. Critics of the MX system have suggested that the Soviet Union will be able to deploy warheads more quickly and cheaper than the United States can build shelters. The 4,600-shelter MX system is a design against a number of Soviet warhead [deleted].

Dr. Zeiberg and General Burke, against what size threat is the present MX/MPS systems designed?

Dr. ZEIBERG. The 200 missile, 4,600 shelter configuration of MX is based on a [deleted] threat of [deleted] reentry vehicles having a CEP in the [deleted] range. It is true that SALT II allows higher levels.

SOVIET WARHEADS VS. MX SHELTERS

Senator WARNER. Critics of the MX system have suggested that the Soviet Union will be able to deploy warheads more quickly and cheaper than the United States can build shelters. The 4,600 shelter MX system is a design against a number of Soviet warhead [deleted].

General Allen, against what size threat is the present MX/MPS system designed?

General ALLEN. The baseline MX/MPS system is designed to be extremely flexible and responsive to a wide range of increased Soviet threats. The baseline design had been sized to provide [deleted].

Soviet allocation of more of their warheads to attack MX would also reduce the number of warheads targeted on other U.S. systems, thus increasing their survivability. At present, reliable estimates put the projected 1989 USSR moderate strength at less than [deleted] accurate RVs. Should they decide to expand their force structure, there would be a variety of cost-effective options available to maintain the effectiveness of the MX/MPS system. By deploying additional shelters, missiles, a Low Altitude Defense System (LoADS), or a combination thereof, the MX could counter any realistic Soviet threat.

MX RESILIENCE TO INCREASES IN THREAT

Senator WARNER. Dr. Zeiberg and General Burke, how confident are you that the MX/MPS system can be expanded to counter greater than anticipated Soviet threats?

Dr. ZEIBERG. Nothing has occurred in the 18th months of full scale engineering development of MX to destroy my confidence that MX can be expanded to counter greater threats. One of the great strengths, in fact, of the MX/MPS concept is that it is able to be expanded more quickly and with less cost than possible through development of a new type of response to the increased threat.

EXPANDED MX/MPS SYSTEM

Senator WARNER. General Allen, how confident are you that the MX/MPS system can be expanded to counter greater than anticipated Soviet threats?

General ALLEN. We are confident that the MX system will be able to adapt to a range of increased Soviet threats. Additional shelter deployments and/or the deployment of additional missiles/warheads would provide a cost-effective and timely response to a moderate threat increase. In the case of a very large increase in Soviet warheads, complementing the MX/MPS system with a specially-designed Ballistic Missile Defense, such as the Low Altitude Defense System (LoADS), would be an effective response.

COST OF SOVIET WARHEADS VERSUS MX/MPS SHELTERS

Senator WARNER. Dr. Zeiberg and General Burke, could you compare the cost of MX/MPS shelters with the cost of Soviet warheads?

Dr. ZEIBERG. We studied this question in some depth last year and reported the results in the Appendix of the Secretary's Top Secret April 1980 Report to Congress, MX/MPS Survivability Against Increasing Soviet Threats. We have had no reason to doubt the continuing accuracy of its conclusions. For your convenience, I am happy to repeat its conclusions that, "—the U.S. can maintain the ability to offset very large Soviet ICBM RV growth at similar or slightly lower incremental costs than the Soviets would spend to provide the increased threat."

COMPARE COST

Senator WARNER. General Allen, could you compare the cost of MX/MPS shelters with the cost of Soviet warheads?

General ALLEN. We estimate that the cost of adding one additional shelter within an existing multiple protective shelter deployment area would be about [deleted] in constant 1980 dollars. If one additional shelter were to be added beyond the existing deployment area, this cost would rise to roughly [deleted] due to additional support costs which would be incurred.

We estimate that Soviet costs, on the other hand, would be about [deleted] for additional fractionated reentry vehicle on an existing ICBM, or about [deleted] to add one reentry vehicle on a new-silo-based missile. These estimates do not include costs of special nuclear materials.

WARHEAD VERSUS SHELTER RACE

Senator WARNER. Dr. Zeiberg, in a warhead versus shelter race the Soviet Union began with more warheads than we have shelters, how can we be sure that they will not stay ahead of us?

Dr. ZEIBERG. Our answer has not changed materially from that presented in the Appendix of the Secretary's Top Secret April 1980 Report to Congress, "M-X/MPS Survivability Against Increasing Soviet Threats (U)". At that time, we stated that our baseline program for offsetting the projected threat called for a shelter deployment rate of [deleted] per year. We note that an escalated threat would be offset by increasing our shelter deployment rate to nearly [deleted] per year. If the Soviets were to launch an all out arms race, we would then develop and deploy a ballistic missile defense system that would effectively double the number of existing shelters and double the shelter deployment rate. I am confident, therefore, that we can perform effectively and in a timely manner in virtually any race of the type you asked about.

ROLE OF BMD AND MORE MX MISSILES IN AN ARMS RACE

Senator WARNER. Dr. Zeiberg, if the Soviet Union should choose to engage in an arms race against MX, what role could ballistic missile defense or the deployment of more MX missiles play?

Dr. ZEIBERG. In any arms race against MX, our first response would be to proliferate empty shelters to offset the increased threat. If that threat increased further, we might deploy more MX missiles in order to maintain the needed probability that the required number of MX missiles would survive. If the threat continued to expand, we might deploy a ballistic missile defense, the role of which is to effectively double the number of shelters since the enemy would then have to shoot at least twice at every shelter.

LAUNCH-INTO-ORBIT ALTERNATIVE TO MX

Senator WARNER. Dr. Zeiberg, could you comment on launch into orbit and cruise ballistic missiles?

Dr. ZEIBERG. Both these concepts have the inherent dependence on warning that we need to avoid whenever possible. The protective launch into a survivable mode in orbit has several grave problems. Its launch would alarm the Soviets and might trigger instant retaliation. Further, launch on false warning means a major loss of our assets during recovery. Lastly, the orbital approach is prohibited by treaty. The cruise ballistic missile would not pose these additional problems beyond its inherent dependence on warning, but the technology is very difficult. It would be some years before we could even have a technology demonstration flight.

LAUNCH INTO ORBIT AND CRUISE BALLISTIC MISSILES

Senator WARNER. Recent press attention has been given to launch into orbit and cruise ballistic missiles as alternatives to MX. Launch into orbit would fire warheads into space and then recover them if the warning of attack were false. Cruise ballistic missiles would be launched into the atmosphere where wings would be deployed and the missile would fly around until the validity of the attack were determined.

General Allen, could you comment on launch into orbit and cruise ballistic missiles?

General ALLEN. Launch into orbit and cruise ballistic missiles do not satisfy the requirements which have led us to the MX multiple protective shelter system. Development of these systems would not be timely enough and these concepts depend on the survivability of tactical warning systems. Questions related to crisis stability, recovery and reconstitution, and survivability of secure command and control systems also remain to be answered.

Moreover, such orbiting of weapons in space would be in violation of the Treaty on Principles Governing Actions of States in Exploration and Use of Outer Space.

INDEPENDENCE FROM WARNING

Senator WARNER. General Allen, in your statement you indicate that "Independence from Warning" is perhaps the most important characteristic of the survivable ICBM force. Several alternatives to MX and MPS systems are highly dependent on warning, for example, Ballistic Missile Defense and Launch Under Attack. General Allen, why is independence from warning so important in your own personal view?

General ALLEN. First, independence from warning is synonymous with assured survivability. It presents us with the assurance an opponent must recognize that even if he surprises us with a perfectly executed attack, he will face a devastating retaliation by surviving forces. Second, the ability to ride-out an attack contributes to stability and reduces the possibility of a nuclear war being triggered by an accident. An ICBM force which depends upon warning for survivability could create a perception that we are in a "use or lose" situation. The need to employ the missiles quickly in order to insure their survivability could decrease stability and increase the chance of miscalculation or error. Finally, the other two legs of our strategic Triad depend on warning in varying degrees for their survivability. Thus, a survivable ICBM force which is "independent of warning" will enhance the overall deterrent effect provided by a Triad of forces.

U.S. LOSE WARNING

Senator WARNER. General Allen, could you describe for this committee how the U.S. might lose its tactical warning of strategic nuclear attack?

General ALLEN. Our tactical warning sensors are complex, fragile and contain many [deleted]. The individual systems are vulnerable [deleted] and to natural catastrophes. [Deleted.]

Furthermore, over the past two decades we have witnessed a very real reduction in the capability of our air defense system to provide atmospheric surveillance and to provide adequate warning of and defense against penetrating aircraft.

MX FAVORABLE ARMS CONTROL IMPLICATIONS

Senator WARNER. Some arms control enthusiasts have criticized MX because it is a powerful new weapon system in our arsenal. Nevertheless, the Multiple Protective Structure system permits the United States to maintain essential equivalence at lower levels of nuclear weapons because of the improved survivability. In short, the initial U.S. response to more Soviet warheads is more shelters until such time that the increased threat is made absolutely clear, when the United States would then consider deploying additional missiles and warheads of its own.

Dr. Zeiberg, do you believe that the MX missile and MPS system has positive implications for arms control?

Dr. ZEIBERG. Yes, certainly. Because we increase the number of shelters rather than the number of missiles.

MX ARMS CONTROL IMPLICATIONS

Senator WARNER. Dr. Zeiberg, if an increased Soviet threat to MPS resulted in the U.S. increasing the size of its MX missile force so as to seriously threaten a larger percentage of the Soviet ICBM force, then the Soviet Union might be driven to adopt an MPS system or a mobile built around smaller missiles or it might move its missiles in greater proportion to sea. Could you comment on the positive and negative aspects for arms control of U.S. deployment of MX?

Dr. ZEIBERG. One of the advantages of the MX MPS basing solution is that we can proliferate shelters rather than more missiles. If the number of missiles remains constant, then we are no more threatening to the Soviet Union than we were before. On the other hand, it would clearly enhance crisis stability if the Soviet Union were to move its missiles out of fixed silos and into either a mobile basing solution, or to move its missiles to sea. Alternatively, the Soviet Union might reasonably respond to our deployment of MX by seeking negotiation

of an agreement to allow defense of silo-based ICBMs. Depending on the nature of their proposal, we might regard such a step as stabilizing and, thus, a positive outcome.

ARMS CONTROL IMPACT STATEMENT

Senator WARNER. The fiscal year 1982 arms control impact statement concludes that MX can play a valuable role in arms control. Do you agree?

Dr. ZEIBERG. Yes, I do.

MX WARHEADS

Senator WARNER. Currently the existing MK-12A is slated to be the reentry vehicle on the MX missile. The MK-12A [deleted] the yield of the existing MK-12, but many scientists believe that a warhead of even larger yield would be more useful.

General Allen, what has been done to keep open the option of deploying at least some of the MX missiles with a larger warhead?

General ALLEN. The previous administration directed the joint DOD/DOE group studying the MX warhead issue to maintain the option to deploy an alternative warhead/RV system on a portion of the MX force. Following that direction, we have maintained electrical and mechanical compatibility of both the baseline MK-12A and the larger warhead with the MX Post Boost Vehicle. At present, only a limited amount of advanced development is continuing on the Advanced Reentry System program.

ADVANTAGES/DISADVANTAGES OF LARGER WARHEAD

Senator WARNER. General Allen, what are the advantages and disadvantages of deploying MX with a larger warhead?

General ALLEN. A larger warhead, deployed in an Advanced Ballistic Reentry Vehicle (ABRV), has been studied as a candidate for deployment on a part of the MX force. [Deleted.]

The principal disadvantage of the larger warhead is the additional cost, about \$1.2 billion (in fiscal year 1982 dollars), to develop and deploy the ABRV in a block change. Initiating a development program at this time, to meet the July 1986 MX IOC, would significantly increase risk. [Deleted.] This latter point presumes that the proposed SALT II limit of ten RVs is not imposed on the MX.

MINUTEMAN MESP BATTERIES

Senator WARNER. The endurance of Minuteman missiles surviving an attack is limited by the life of its batteries. Air Force efforts to fund the MESP batteries to extend the life of Minuteman have been turned back in recent years because of low priority.

General Allen, will the MESP batteries be included in the fiscal year 1982 program or in the fiscal year 1981 Supplemental?

General ALLEN. The fiscal year 1982 Amended Budget request includes \$45.0 million for the Minuteman Extended Survival Power Program (MESP) which will install lithium batteries in the 550 Minuteman III launch facilities.

PRIORITY OF MESP BATTERIES

Senator WARNER. General Allen, what priority does the Air Force give to the Minuteman Extended Survivable Power (MESP) batteries?

General ALLEN. MESP has a high priority since it will make a significant contribution to Minuteman trans/post-attack effectiveness and flexibility by providing surviving missiles with an enduring power source (lithium batteries). We are requesting \$45.0 million for this program in the fiscal year 1982 amended budget.

AIRS IN MINUTEMAN

Senator WARNER. The Advanced Inertial References Sphere (AIRS) will provide the MX missile with its super accuracy. This guidance sphere has been tested on Minuteman missiles in a piggyback mode. Has consideration been given to placing the AIRS guidance system in Minuteman missiles?

General ALLEN. Consideration has been given to installation of AIRS on operational missiles; however, the proposal was rejected due to costs involved in accomplishing system redesign, flight tests (of the modified configuration), and procurement necessary for Minuteman application.

IMPROVE MM ACCURACY

Senator WARNER. What are the advantages and disadvantages of improving Minuteman accuracy?

General ALLEN. Advantages include the increased damage expectancy and enhanced prompt hard target kill probability which would result from improved accuracy. The major disadvantage of improving Minuteman III accuracy beyond current capabilities—for example, through the installation of the Advanced Inertial Reference Sphere (AIRS)—would be the high cost of such a program relative to the declining survivability of the Minuteman system.

TECHNOLOGICAL REASONS

Senator WARNER. Are there any technological reasons why Advanced Inertial Referenced Sphere (AIRS) could not be placed in Minuteman in an operational system?

General ALLEN. There are no technological reasons why AIRS could not be installed on operational Minuteman missiles. However, such a program would require equipment redesign to accommodate AIRS in the Minuteman guidance subsystem. The new configuration would then require a series of up to twenty flight tests to establish and verify system accuracy for war planning purposes.

MX VERSUS TITAN II

Senator WARNER. Our largest warhead is carried on a Titan II missile which is quite old. It will be replaced when the MX missile comes on line. Could you explain for the committee how Mk-12A warheads on the MX will replace the large warhead on the Titan II missiles?

Dr. ZEIBERG. First, let me clarify the point that we have not made a decision about when to deactivate the Titan II system. Such a deactivation would probably be accommodated by a combination of appropriate targeting of some of the 2000 MX warheads and retargeting of the Minuteman II and III warheads.

TITAN II WARHEAD ON MX

Senator WARNER. Can the MX missile carry the Titan II warhead?

Dr. ZEIBERG. Our quick look shows that the Titan II reentry vehicle will fit within the dimensional constraints of the MX missile. However, the greater weight imposes a range limitation of about 4,000 nautical miles, virtually eliminating its utility against Soviet targets.

MX MISSILES IN TITAN II SILO

Senator WARNER. Could more than one MX missile be placed inside a Titan II silo?

Dr. ZEIBERG. Yes, that is dimensionally possible with some rearranging of silo support equipment. Such missiles would have to be cannisterized because of the hostile launch environment. Although three such cannisters could fit, pragmatics limit the number to two. I must point out, however, that placement of any MX missile in a Titan silo is to place a valuable asset in a vulnerable basing mode.

DEPLOYMENT OF MX IN TITAN II SILOS

Senator WARNER. Does it make any sense to place MX missiles in existing Titan II silos?

Dr. ZEIBERG. Since the whole reason for developing the MX system is the projected inability of any fixed target, such as our current ICBMs, to survive. I am skeptical that it would be desirable to deploy a new weapon system permanently at a fixed location. On a temporary basis, one might consider deployment of MX missiles in Titan II silos if the MX missiles could be made available much sooner than the intended protective shelters. However, the possible positive perceptual value might be outweighed by their vulnerability, the cost of silo retrofit, and the range penalty. I could not recommend such a deployment without further study.

TRIAD OPERATING COSTS

Senator WARNER. Traditionally the ICBM leg has been the least costly leg of the strategic triad because of its low operating cost. Could you describe the operating costs for each of the systems currently in the triad and compare those with

the costs anticipated for the *Ohio* class submarines, the MX missile system and the ALCM B-52 bomber force?

Dr. ZEIBERG. The comparison of these operating costs is shown below. The figures include military personnel costs, phaseout of older B-52s, and incorporation of lower maintenance B-52 avionics.

	Annual operation and maintenance and costs, fiscal year 1980 (millions)
Minuteman/Titan	\$330
B-52	948
Poseidon/Trident I Backfit	1039
MX (200/4600 config.)	440
B-52/ALCM (approximately 2,300 missiles)	733
Trident (15 SSBN's)	663

OPERATING COSTS OF MX ALTERNATIVES

Senator WARNER. Were significant differences found in operating costs among different MX/MPS basing modes?

Dr. ZEIBERG. The projected annual operation and maintenance cost is less than two percent of the total cost of the MX/MPS system, so we have not looked hard at such costs as serious discriminators among MPS alternatives. On the other hand, operation and maintenance costs of other alternative basing modes such as air mobile and sea basing are significantly greater and have been considered.

LEGAL ASSISTANCE/LEGISLATION FOR MX

Senator WARNER. Much of the problems concerning the MX missile system evolves from the possibility that the program will be delayed in court due to environmental concerns. What kind of legislation could expedite consideration of environmental issues through the administrative process or in the courts? Would Alaska pipeline type legislation be useful in expediting consideration of legitimate environmental issues without delaying the MX program?

General ALLEN. Although we feel that litigation is a near certainty, we do not think that an injunction, which would delay deployment, will result. Rather, we believe that the courts will follow past National Environmental Policy Act litigation precedent and will not enjoin a program so clearly linked to the security of the Nation. However, should this precedent not be followed and problems develop which would threaten the MX initial operational capability, Congress could pass legislation similar to the Trans-Alaska Pipeline Authorization Act, which ruled that an Environmental Impact Statement was adequate and prohibited judicial review as to its adequacy.

BMD AND MX

Senator WARNER. Ballistic Missile Defense and Multiple Protective Structures both can contribute to survivability of ICBMs and in some ways are mutually reinforcing. For the record, could you describe for this committee possible synergistic scenarios involving MX in silos or in MPS and ballistic missile systems built around LOADS, exoatmospheric intercept, and directed energy weapons?

Dr. ZEIBERG. LOAD, exoatmospheric interceptors and directed energy weapons could, in principle, all be used either singly or in combination to defend ICBMs based either in silos or MPS. However, it should be noted that each concept utilizes different technologies that are at vastly different levels of maturation and are characterized by different risks and availabilities.

LOAD uses technology that is currently mature and well proven to intercept reentry vehicles in the last few seconds of their flight. It is ideally suited to the defense of MX in MPS because the small components can be readily moved as MX is moved. By exploiting the leverage of MPS basing and defending only shelters containing the MX missiles, or itself, the relatively simple, short range system could be very cost effective in dealing with large threats. A single LOAD intercept in defense of an MX missile in the baseline MPS basing could effectively offset a growth of 23 Soviet reentry vehicles.

Silo defense is more difficult than MPS defense because the leverage available from deceptively basing the MX missile is lost. To achieve leverage for silo defense, LOAD components could be deceptively based near some silos and

moved occasionally or they could be moved to defend a particular silo after warning of an attack. Either approach is similar to MPS but the leverage is lower because the MX location is known. The operating range of the LOAD components could also be extended somewhat beyond that required for MPS basing so that a single defense unit could preferentially defend a few silos. Any of these approaches represents a higher operational risk and a lower leverage than the use of LOAD for MPS defense.

Exoatmospheric interceptors, or Overlay defense, offer the promise, when proven, of reducing the operational risks for silo defense but they currently represent a higher development risk. The Overlay defense will achieve high leverage by preferential defense. Each interceptor will use multiple, non-nuclear kill vehicles to intercept the reentry vehicles several minutes before impact. A single exoatmospheric interceptor with twelve kill vehicles could offset about twenty Soviet reentry vehicles. The Overlay technology is not yet mature and there are several key technical issues to be resolved. It will be a few years before we can have reasonable confidence that the Overlay defense can perform as predicted and can be produced at the projected costs. It will be several years after that before a system could be available.

Directed energy weapons employ the least mature technology of the three concepts and are unlikely to be available for ballistic missile defense in this century. If developed and deployed in space they could be employed to intercept ballistic missiles during their boost phase, which would result in the highest possible leverage.

QUALIFIED SOURCES FOR NOSETIPS

Senator WARNER. General Allen, in your opinion, would you prefer to have more than one officially qualified source for the carbon-carbon nosetips for the MK-12A warhead?

General ALLEN. While we would always prefer to have more than one source for any commodity, we are also determined to obtain the commodity at the least possible cost. In many cases a second source, while desirable, is not fiscally practical.

COMPETITION FOR MK-12A NOSETIP PRODUCTION

Senator WARNER. General Allen, could you describe Air Force policy and specific actions related to providing competition for the production of MK-12A nosetips?

General ALLEN. Air Force policy is to encourage and maintain competition in all acquisitions. The MK-12A nosetip program has followed that policy. During the nosetip material and process program, several contractors were utilized to provide opportunities for competition during production. The low bidder in all cases was awarded the production contract.

PRICES OF FUTURE MK-12A NOSETIP BIDS

Senator WARNER. General Allen, recent bids on MK-12A nosetip quoted prices which were nearly half those quoted in previous bids. In constant dollars, does the Air Force expect to get similar prices on future bids for MK-12A?

General ALLEN. The low prices were obtained because an extremely small quantity (10 units) was involved and the contractor had previously won a competitive award for a large quantity of nosetips and was able to combine the lesser quantity in a large production run. It is not possible at this time to speculate on future nosetip bids/prices.

SMALL BUSINESS POLICY

Senator WARNER. General Allen, what is Air Force policy on promoting the effective use of small business contracts to promote competition and a more diverse industrial base?

General ALLEN. The Air Force fully endorses and supports the policy expressed in the Small Business Act and attempt to insure that a fair proportion of Air Force contracts and subcontracts are placed with small business concerns. Through component and spare parts breakout programs and through contracting procedures and programs developed to assist small businesses, the Air Force in fiscal year 1980 awarded contracts valued at \$2.4 billion to small business concerns.

QUESTIONS SUBMITTED BY SENATOR JOHN STENNIS

MX—MOST IMPORTANT MILESTONE

Senator STENNIS. It appears that completing the environmental impact statement and getting legislation that allows the Air Force to withdraw land for the MX system is the most important milestone in achieving the July 1986 IOC. Is that correct?

General ALLEN. Yes. Current schedules hinge on the availability date of the lands required for construction of MX facilities. This includes the first operating base and protective shelters along with the roads required to support the first ten missiles.

MEET MX IOC

Senator STENNIS. According to testimony given last year by Air Force witnesses, there was virtually no slack in the development schedule for the MX program if you were to realize IOC by July 1986. Further testimony showed the schedule was based on submitting land withdrawal legislation in January 1981 and having it approved by August 1981. Now you say you will submit the land withdrawal legislation in August 1981, about eight months beyond your schedule of last year. Can you meet your July 1986 IOC despite this slip?

General ALLEN. Yes, but the schedule will be tight. We cannot apply for land withdrawal until the final Environmental Impact Statement is filed and the deployment area selection made. We currently plan to apply for the withdrawal of public lands in the August 1981 time frame. Under normal procedures, after review and administrative processing, the Department of Interior would forward the withdrawal legislation and application about January 1982, making land available in April 1982.

In order to meet the July 1986 IOC construction must begin in early 1982. Therefore, we are on a very compressed schedule, and the Air Force and DOD are looking very carefully at ways to avoid delay. We will be working closely with Congress to explore alternatives which will keep the program on schedule.

ABSORB ANY MORE DELAY

Senator STENNIS. If you can still meet the July 1986 IOC schedule even with the current eight-month slip, can you absorb any more delay in the land withdrawal process and meet your schedule?

General ALLEN. No, we cannot. Additional delays would adversely affect the deployment schedule for MX.

PROCEED IF REVIEW NOT COMPLETED

Senator STENNIS. The Reagan administration is making a major review of the MX program as indeed is appropriate for a new administration to do. If that review is not completed by July 1981, will you go ahead and submit the Environmental Impact Statement and the land withdrawal legislation so as to meet the July 1986 schedule?

General ALLEN. We have been directed to proceed with the existing MX schedule, while the MX basing mode review proceeds.

QUESTIONS SUBMITTED BY SENATOR HENRY JACKSON

D-5 VERSUS MX

Senator JACKSON. What are the relative strategic merits of the proposed D-5 missile versus the MX missile in terms of range, number of nuclear warheads, maximum deliverable yield, and accuracy?

Dr. ZEIBERG. The relative merits are shown below :

	Range (nautical miles)	RV's	Maximum yield	CEP (feet)
MX	5,800	10	[Deleted]	[Deleted] at 5,800 nmi.
D-5	[Deleted]	[Deleted]	[Deleted]	[Deleted] at 4,000 nmi.

MIX OF MX AND TRIDENT II

Senator JACKSON. How has the tradeoff analysis been performed and what are the results in terms of strategic benefit and associated costs of for instance building one more Trident II submarine than currently planned and substituting these missiles in lieu of a comparable number of MX missiles? Stated differently, how was the relative mix of 15 Trident submarines and 200 MX missiles decided and what is the strategic sensitivity analysis to support this mix?

Dr. ZEIBERG. The problem has been approached from two directions. Historically, we have had about one-third of our strategic force in each leg of the Triad, and this seems to be a good rule of thumb to follow. The importance of maintaining different survivability modes for the strategic deterrent transcends cost-effectiveness calculations, since these calculations could change catastrophically if one part of the Triad became vulnerable in less time than it would take us to respond. In the second place, an inherent feature of MX is that the force needs to be of a certain size when faced with a given threat. Both of these considerations indicate an MX deployment of approximately the size now planned.

QUESTIONS SUBMITTED BY SENATOR HOWARD CANNON

MX VITAL TO U.S. SECURITY

Senator CANNON. General Allen, in your personal opinion, how vital is the MX missile and a survivable basing mode to the security of the United States?

General ALLEN. Restoration of the survivability of our land-based ICBMs is essential if we are to restore and maintain strategic parity with the Soviet Union and prevent a serious weakening of our strategic deterrent. Without continuation of development funding for the MX program, at the levels proposed in the fiscal year 1982 budget, delays in initial operational capability result. In view of the unrelenting increase in Soviet strategic capabilities and growing vulnerability of our ICBM force, such a delay would in my view, send exactly the wrong signal to foes and friends alike.

URGENCY OF MX DEPLOYMENT

Senator CANNON. General Allen, why is it so urgent to deploy MX in a survivable basing mode at the earliest possible moment when we will already have to accept the vulnerability of our Minuteman and Titan missile forces for some time prior to that?

General ALLEN. Our deterrent posture is built upon the Triad and the complementary effect each element contributes to the whole. A vulnerability of one system can be offset, at least temporarily, by the strengths of the remaining two components thus insuring our deterrent remains strong. For its part, the ICBM provides an effective time-urgent hard target kill capability as a result of its accuracy and responsiveness. For that reason alone, we cannot permit it to remain vulnerable. In a larger sense, though, if one element of the Triad is permitted to remain vulnerable, the Soviets can concentrate their emphasis on the other elements, thereby increasing the prospect that they will be able to neutralize these elements.

Abandoning our ICBM force would dangerously simplify the Soviet Union's task if it was to attempt a disarming first strike. The Triad, with currently programmed improvements such as MX, Trident, ALCM, and the new bomber, will provide us the needed assurance that we would be able to inflict unacceptable damage on the Soviet Union even after absorbing a first strike.

MX IN MINUTEMAN SILOS

Senator CANNON. General Allen, why is it not satisfactory simply to place the new MX missile in the existing Minuteman silos?

General ALLEN. Strategic deterrence is based upon the maintenance of forces which can survive a first strike with sufficient capability to impose unacceptable costs upon the attacker. Placing MX missiles in existing Minuteman silos would increase overall ICBM capabilities but would not improve the long-term problem of ICBM survivability. The most critical issue is the growing vulnerability of

our silo-based ICBM force. With continuing Soviet strategic modernization, that vulnerability will be as high as [90 percent by the mid-1980s.] For more than a decade we have examined in detail various means to maintain the survivability of our ICBM force. These studies have led us to conclude that the deployment of the MX in a horizontal multiple protective shelter basing configuration offers the most effective means to achieve this objective.

MPS UNNECESSARY

Senator CANNON. General Allen, a court injunction recently delayed the testing of one of the rocket motors for the MX missile. If court action or environmental procedures continue to delay the MX program, how likely is it that alternatives to MX MPS basing will have matured sufficiently to make MPS unnecessary?

General ALLEN. In the case referenced, the court did not enjoin testing. Rather, a temporary restraining order was issued, but agreement was reached prior to expiration of the order. No delay to the program resulted.

While we acknowledge that National Environmental Policy Act (NEPA) litigation is a near certainty, we hope to be successful in persuading the courts to follow past precedent and not enjoin deployment of a weapons system so directly linked to the security of this Nation.

There are significant flaws in all other proposed basing modes, flaws which we do not expect to see overcome in a reasonable time frame if ever. Furthermore, all alternative basing modes would have some environmental impacts and would require preparation of an Environmental Impact Statement and completion of the NEPA process. Therefore, I would expect an alternative mode to take more, not less, time because we would have to repeat a significant part of the process just to get to where we are now on MX MPS.

ADVANTAGES OF SPLIT BASING

Senator CANNON. Dr. Zelberg, the split basing study presented to Congress in response to my amendment last year concludes that there are no net advantages or disadvantages to split basing. Nevertheless, it did find some advantages. Could you summarize those for the committee?

Dr. ZEIBERG. The split basing study submitted to Congress in January 1981 identified these advantages of split basing. A second new operating base would not be required; instead, Cannon AFB would be expanded. There would be less significant impact on natural or biophysical environmental resources because the Texas/New Mexico region has already been substantially disturbed by agricultural activities. In numerical terms of the 23 categories of the human environment, split basing causes less impacts in that area, even though it has greater impact in some other categories considered highly significant. The required duplication of some facilities will provide an increased maintenance capacity. Also, duplicate total assets decrease the probability of defeat of the entire system.

The report concludes that split basing offers no overriding environmental, operational, SAL, or scheduled advantages or disadvantages over full basing.

EIS COMMENT PERIOD

Senator CANNON. General Allen, the Air Force recently extended the comment period on the Draft Environmental Impact Statement (DEIS) for MX. Why was that?

General ALLEN. Distribution of the Draft Environmental Impact Statement for comment began on December 23, 1980. Due to the holiday season many deliveries were unavoidably delayed until mid-January. Extending the comment period to May 1981 allows the public the full 90 days offered by the Air Force. It will also allow adequate time for the Air Force and its associate contractors to conduct technical consultation meetings with the review teams in the affected States.

MITIGATE IMPACTS

Senator CANNON. General Allen, the EIS on MX finds numerous adverse economic, social and environmental impacts, some large, some small. If MX were to be deployed in the Great Basin, what is the concept of your overall plan to mitigate these impacts?

General ALLEN. We will continue to use the mitigation-by-avoidance technique in order to avoid using sensitive lands. These include indian reservations, parks, forests, wilderness areas, oil and gas fields, known strippable coal, oil shale, uranium deposits, pipelines, and utility corridors. Doing this before deployment reduces the need for programs to repair, rehabilitate or restore the affected environment. Additionally, coordination with government agencies, special interest groups and public comments on the Draft Environmental Impact Statement (DEIS) should identify new ideas on how to reduce impacts.

We will also continue to participate as part of the intergovernmental working groups to anticipate and resolve local concerns associated with MX. The Air Force will coordinate with state and local officials to determine preferred locations for the MX main operating bases since the most significant impacts are predicted to occur in the vicinity of these bases. Finally, the Air Force will establish a monitoring plan which should assure conformity between the DEIS process and site-specific resources protection. It will provide the means of evaluating the accuracy of impact predictions, discovering unanticipated effects, identifying new mitigative requirements, and insuring implementation of mitigations planned.

IMPACT OF SPLIT BASING

Senator CANNON. General Allen, if the split-basing plan were to be adopted, what would be the overall impact on Nevada and Utah with respect to the influx of construction workers and other impacts?

General ALLEN. Our analysis shows that split basing shifts a portion of both the good and bad impacts of MX construction and basing from Nevada/Utah to Texas/New Mexico. The overall influx of workers and other overall impacts on the Nevada/Utah region would be reduced by split basing. However, the impacts are manageable under either the proposed action or split basing. Split basing would not change the localized impacts around the proposed operating base at Coyote Spring, Nevada, nor around those valleys where construction would still occur. Split basing offers no overriding advantage or disadvantage. It merely costs more than the proposed action.

IMPACT OF VERTICAL VERSUS HORIZONTAL

Senator CANNON. General Allen, would the adoption of vertical rather than horizontal shelters make much difference in the environmental or social or economic impact on the Great Basin?

General ALLEN. The horizontal and vertical shelter configurations would have essentially the same environmental and socio-economic impacts. The amount of land, construction materials, and the labor force required to construct, operate, and maintain the system are not sensitive to shelter configuration.

VALLEY CLUSTERING

Senator CANNON. General Allen, could you describe how valley-clustering and other techniques might be employed to reduce the impact of the MX/MPS basing system on the Great Basin?

General ALLEN. Valley clustering would allow all shelters in a given valley would be interconnected. This would eliminate the need for a cluster maintenance facility for each missile deployed. Rather, a cluster maintenance facility would be required only for each valley cluster, reducing the number of such facilities from 200 to about 30.

In this same light, one of the most promising activities we have under way to reduce construction impact is the use of automated techniques to construct the 4,600 multiple protective shelters. We are examining both cast-in-place and cast-off-site methods. Either of these may provide the means by which we will be able to reduce significantly the construction labor force.

BMD AS A SUBSTITUTE

Senator CANNON. Dr. Zeiberg, is Ballistic Missile Defense a substitute for MX and MPS basing in the same time frame?

Dr. ZEIBERG. Ballistic Missile Defense (BMD) can be thought of as a substitute for additional shelters that would otherwise be required to respond to an

increased threat. We are confident that we could have a site defense system ready in time to counter the actual deployment of a threat large enough to force us to go that way.

BMD VERSUS MX SIZE

Senator CANNON. Dr. Zeiberg, could Ballistic Missile Defense reduce the size of the MX system which might ultimately be required?

Dr. ZEIBERG. That is precisely the effect of a Ballistic Missile Defense (BMD) system since it effectively doubles the number of shelters an enemy would have to destroy. Said another way, BMD halves the size of the deployed system.

WATER AND CONCRETE PROBLEM

Senator CANNON. General Allen, what will be done to address the problem of water and concrete availability in the western States.

General ALLEN. Our analysis indicates that sufficient construction resources should be available. MX steel and cement requirements represent a very small percentage of existing and projected annual output. Furthermore, consideration is being given to advance procurement and stockpiling of cement and steel to reduce surge demands during peak construction periods and to stabilize prices. As to water resources, we believe there will be sufficient water for MX and other projected users.

SPACE LASERS

Senator CANNON. General Allen, could you comment on the possibility of space lasers providing an alternative to MX in an MPS basing system?

General ALLEN. High energy lasers do not offer a reasonable alternative to basing the MX in multiple protective structures. I believe that even with a massive effort, the U.S. would be [deleted] away from an effective space laser ballistic missile defense system. We are already in a period of growing vulnerability in our land-based ICBMs and there is an urgent need to remedy this situation as soon as possible during this decade.

Senator CANNON. Dr. Zeiberg, could you comment on the possibility of space lasers providing an alternative to MX in an MPS basing system?

Dr. ZEIBERG. [Deleted] space lasers be operationally available to an extent that would constitute an alternative to MX in an MPS basing system.

BROADNESS OF MX REVIEW

Senator CANNON. Dr. Zeiberg, how broad is the study of MX basing being conducted by the Reagan administration, and will it include questions such as environmental and social impacts?

Dr. ZEIBERG. We are proceeding with a vigorous and thorough review of MX basing options and will make a final decision by July 1. While conducting this review, we will continue to pursue the baseline MX program. A final judgment by July 1 will permit a thorough technical and policy review, yet maintain the current program schedule. This timing also enables us to consider adequately public comments on the MX draft environmental impact statement.

LAUNCH WARHEADS INTO ORBIT

Senator CANNON. Dr. Zeiberg, why is it not possible to launch warheads into orbit on warning of a possible Soviet attack and then recover those warheads if the warning proves to be false?

Dr. ZEIBERG. In fact, what you are asking about is possible, but it is unacceptable to us for several reasons. In the first place, it has the inherent dependence on warning that we need to avoid whenever possible. Also, the protective launch into a survivable mode in orbit would alarm the Soviets and might trigger instant retaliation. Further, launch on false warning means a major loss of our assets during recovery. Lastly, such an orbital approach is prohibited by treaty.

ORBIT WARHEADS

Senator CANNON. General Allen, why is it not possible to launch warheads into orbit on warning of a possible Soviet attack and then recover those warheads if the warning proves to be false?

General ALLEN. Though such an option is technically conceivable, other factors argue strongly against it. First, such an option would be dependent on decisions made in the midst of a time compressed and ambiguous environment. Second, launch of a large number of ICBM's to place warheads in orbit could well be interpreted by the Soviets as the initiation of a massive strike and, as a result, evoke a strike on the U.S. Third, recovery and reposturing of orbiting nuclear warheads would be a lengthy process, the result being that our weapons wouldn't be available for employment for a period of time. Finally, placing nuclear or other weapons of mass destruction into orbit would violate the Space Treaty, which bars deployment of such weapons.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

MEASURES OF STRATEGIC BALANCE

Senator LEVIN. General Ellis uses 1977's strategic balance between the U.S. and USSR as the standard against which we should measure the present and future balance. Do you think this is the only "yardstick" we should use?

How would you measure the balance, and on what would you base a conclusion whether the U.S. is in essential equivalence, rough parity, tenuous parity, or strategic inferiority with the Soviet Union?

What quantitative measures would you use in addition to MDE—military damage expectancy and VD—economic value damage?—What non-quantitative measurements must be included?

General ALLEN. The "yardstick" used by General Ellis is, of course, only one of many measures used to portray the strategic balance which has existed between the U.S. and the USSR since 1977. While other measurements and assessments of the strategic balance conducted by the Joint Chiefs of Staff and the Office of the Secretary of Defense may use different quantitative and non-quantitative methods than those used by General Ellis, each of these assessments indicate that we are, at best, in a situation of "tenuous parity" with the ominous prospect of reaching a position of distance inferiority if we do not proceed without delay to modernize our strategic forces. This underscores the need to proceed with the programed improvements to our strategic forces—MX, ALCM, Trident, Long Range Combat Aircraft.

DAMAGE EXPECTANCY PERCENTAGES

Senator LEVIN. General Allen, you were a high ranking Air Force officer in 1977. Do you know why it was decided that the MDE and VD percentages for both the U.S. and USSR [deleted] represented a condition of balance, other than the raw numerical equalities? Were non-quantitative assessments included?

General ALLEN. In 1977 the administration chose to describe as the strategic "balance" which existed between the U.S. and USSR at that time as one of "essential equivalence." This assessment was based on comparisons of equivalent megatons, total weapons, MRVs, and strategic nuclear delivery vehicles as well as various qualitative aspects of strategic weapon systems. General Ellis, using the MDE and VD percentages you reference, has chosen to display that same 1977 situation as a benchmark for assessing our strategic posture since that time. Non-qualitative factors such as strategy, tactics, and targeting doctrine were also included in this strategic balance assessment. In my view, assessments such as these provide a valuable insight regarding our capabilities and shortcomings and provide a basis for planning.

SOVIET MEASURE OF STRATEGIC NUCLEAR BALANCE

Senator LEVIN. How do the Soviets measure the strategic nuclear balance? Do they use the MDE and VD percentages in the same way as we do? What do we think their requirements are for VD? Do we know whether we have any requirements for MDE? Do they use non-quantitative measurements, also?

General ALLEN. We do not have the specific information on how the Soviet leadership measures the strategic nuclear balance. However, if the Soviet Union makes calculations that would correspond to this type of analysis, they would

probably place more emphasis on perceived trends in the force balance equation than in the specific percentages associated with MDEs. In this regard, the Soviet Union is clearly aware that their force improvements have resulted in a marked change in the strategic balance in their favor. This situation makes it all the more urgent for us to get on with programmed improvements to our strategic Triad, which includes M-X, Trident, ALCM, and a Long Range Combat Aircraft.

Senator LEVIN. [Deleted.] We so far have decided we must first have enough weapons in reserve to reach [deleted], and then any percentage of MDE would result from whatever weapons remained.

If we have [deleted], why should we accept the 1977 MDE statistic General Ellis promotes as the ultimate measurement of what constitutes what we need to obtain as a capability, and of what we need to accomplish our deterrent and warfighting purposes? Why should that be seen as the standard-setter for "the balance" as opposed to any other number, as long as that other number accomplishes our warfighting and thus our deterrent purposes?

General ALLEN. General Ellis' Military Damage Expectancy (MDE) analysis is his means of depicting our deteriorating capability to attack both the Soviet [deleted]. There are other methods for representing this capability; however, they all show the same adverse trends displayed by General Ellis. We must maintain a substantial capability against both soft and hardened targets. This is the essence of a credible deterrent and defense capability. Without force modernization, our capability to meet our objectives will continue to decline regardless of the means used to portray the trend.

DIFFERENCES IN MDES

Senator LEVIN. General Allen, in his measurements of the balance from 1977 to 1981 to 1987 to 1990, General Ellis establishes the MDE's at [deleted] against USSR, respectively.

Do you see much difference between [deleted] in terms of how powerful and capable the Soviets perceive our forces as being? Do you think they will make any distinction if we destroy [deleted] of their military targets as opposed to [deleted]? Would they be less upset if we destroyed [deleted] as opposed to [deleted].

General ALLEN. If the Soviet Union makes calculations that would correspond to this type of analysis, they would probably place more emphasis on perceived trends in the force balance equation than in the specific percentages associated with MDEs. In this regard, the Soviet Union is probably aware that their force improvements have begun to tip the strategic balance in their favor. This situation makes it all the more urgent for us to get on with programmed improvements to our strategic Triad, which includes MX, Trident, ALCM, and a Long Range Combat Aircraft.

MEASURE OF EFFECTIVENESS DRIVES

Senator LEVIN. General Allen, I was told that the measure of effectiveness driving the requirement for [deleted] surviving MX reentry vehicles (RVs), and thus a 200-missile system, was that this is the number the AF thinks we need to combine with the [deleted] Minuteman RVs we would expect to survive a first strike, as well as with other strategic forces, to achieve the [deleted] against the USSR we were able to achieve in 1977. Do you agree with this analysis?

General ALLEN. Yes. The requirements analysis you describe was developed by the Strategic Air Command and accepted by the Air Force as the basis for developing the force size of 200 MX/4,600 MPS for the system. It is based upon a number of assumptions and variables, including U.S. goals, the threat, status of other U.S. forces, and strategic arms limitations. The initial deployment of MX/MPS will be determined at DSARC III in 1983, and will be based on a thorough review of the assumptions and variables at that time.

BOMBER DELIVERED WEAPONS

Senator LEVIN. General Allen, bomber delivered weapons have the capability to destroy hardened military targets, do they not?

General ALLEN. Yes. Gravity weapons carried by our current bomber force are capable of destroying hardened military targets. The forthcoming deployment of Air Launched Cruise Missiles will significantly increase our capability against such targets.

INTERIM BOMBER

Senator LEVIN. In fact, is it not true that the interim bomber is the proposed "quick fix" to our strategic balance and will be used to increase our Military Damage Expectancy according to General Ellis?

General ALLEN. There are no "quick fix" solutions that would restore the strategic balance. A near term strategic bomber, along with continued ALCM production and modernization of our ICBM and SLBM forces, will increase our Military Damage Expectancy during this decade.

DEPLOY M-X

Senator LEVIN. General Allen, should we deploy M-X in silos, or not deploy it at all and maintain our Minuteman missiles and perhaps deploy more Mark 12As, more powerful warheads, do you think the Soviets would not target them in any first strike?

Do you think that they would not continue to expend much time and money and effort in their own strategic forces to seek better ways to increase their confidence of attacking such a force?

General ALLEN. The Soviets would target our ICBM's in order to reduce the number of U.S. warheads available to attack Soviet targets. The continuing Soviet emphasis on increasing the accuracy and number of deliverable warheads clearly demonstrates their intention to improve their ability to destroy hard targets such as silo-based ICBMs. We estimate that under certain conditions the Soviets will have the ability by the mid 1980s to destroy up to 90 percent of our silo-based ICBMs.

The Soviets are continuing to develop [deleted] new or modified ICBMs. We believe that each of these follow-on systems will have improved hard target kill capabilities, thus making them an even greater threat to a silo-based system.

The M-X deployed in multiple protective shelters is designed to provide the degree of survivability necessary to allow our National Command Authority time to fully assess the affects of a Soviet attack against the U.S. before retaliating.

SOVIET ACTIONS

Senator LEVIN. If the Soviets would continue to worry about these silo-ICBMs to the extent of seeing them as a continuing threat which needed to be neutralized, why do you think they would suddenly begin diverting resources away from their ICBMs and concentrating on their anti-SSBN and anti-bomber/ALCM defenses? Have the Soviets ever been known to agree with us that they have reached a point with any of their forces that they have enough? Do they not continue to pour resources into all areas, and is that not the reason we would expect them to continue to increase their warhead totals, with or without SALT II, but especially without SALT II?

General ALLEN. With or without SALT II, we expect the Soviets to continue to devote substantially increased funds for their strategic forces. The CIA estimates that over the past decade, the Soviet Union was devoted more than [deleted] as many resources to strategic forces as did the U.S. Part of their expenditures have resulted in an increase in the RVs available through modernization programs.

The Soviets continue to view U.S. silo-based ICBMs as a major threat that they are attempting to overcome by upgrading their ICBM capabilities and survivability. While intelligence estimates indicate that the Soviet expenditure on the ICBM force component of their strategic force [deleted].

The Soviet expenditures in the area of anti-SSBN forces [deleted].

The trend of Soviet expenditures in the area of anti-bomber/ALCM defense [deleted]. The quality of these forces has continually increased with deployment of greatly improved aircraft interceptors and SAMs.

[Deleted.]

SOVIETS WORRY ABOUT ICBMS

Senator LEVIN. General Allen, if the Soviets will continue to "worry" about our ICBMs, why can't we leave them in the silos and expand the SLBM and bomber legs of the Triad to achieve any MDE we decide is required? Both of those systems, along with [deleted] surviving Minuteman warheads would be capable of destroying hardened military targets, would they not?

General ALLEN. Our deterrent posture is built upon the Triad and the complementary effect each element contributes to the whole. A vulnerability of one system can be offset, at least temporarily, by the strengths of the remaining two components thus insuring our deterrent remains strong. For its part, the ICBM provides an effective time-urgent hard target kill capability as a result of its accuracy and responsiveness. For that reason alone, we would not permit it to remain vulnerable. In a larger sense, though, if one element of the Triad is permitted to remain vulnerable, the Soviets can concentrate their emphasis on the other elements, thereby increasing the prospect that they would be able to carry out a nuclear attack without suffering unacceptable losses.

Abandoning our ICBM force would dangerously simplify the Soviet Union's task if it was to attempt a disarming first strike. The essence of deterrence is the ability to inflict unacceptable losses on the attacker even after a first strike. The Triad, with currently programmed improvements such as MX, Trident, ALCM, and the new bomber, will provide us this much needed capability.

SOVIETS FRIGHTENED

Senator LEVIN. Why do you think the Soviets would be any less frightened by the damage such a Triad could accomplish, as opposed to one including the MX?

General ALLEN. U.S. silo-based ICBMs are becoming increasingly vulnerable to a Soviet first strike. We project that approximately 90 percent of our Minuteman and Titan II silos could be destroyed by a Soviet ICBM attack in the mid-1980's, thus significantly reducing the number of ICBM warheads surviving to be used against Soviet targets. In contrast, the MX in multiple protective shelters (MPS) would provide U.S. ICBM forces with a significant degree of protection against a Soviet preemptive strike thus insuring the retaliatory potential of the ICBM component of the U.S. Triad. The system would allow us the flexibility of absorbing a Soviet first strike while retaining the number of ICBM warheads needed to neutralize Soviet residual warfighting capabilities. Furthermore, the improved accuracy of the MX will provide a significantly greater hard-target lethality than the Minuteman III.

DURATION OF NUCLEAR WAR

Senator LEVIN. In discussing the characteristics of ICBMs General Burke referred to their "enduring usefulness" during a "protracted nuclear war" because of their "superb command and control."

In designing, planning, and programming our Triad forces, what is the official NCA guidance or requirement imposed regarding the duration of a nuclear war and the length of time during which these forces must survive? How was it determined? Please provide this for each component of our Triad, by system, and explain how each particular survivability, basing, personnel, power supply, support structure, overall numbers and weapons effectiveness characteristics meet, or help meet this "length of war" requirement.

General ALLEN. National policy [deleted]. It does require a high degree of flexibility, enduring survivability, and adequate performance in the face of enemy actions, and that we be capable of terminating the war on acceptable terms even after an enemy initiated attack. Based on this guidance, the Air Force strives to build in as much endurance as possible consistent with the physical constraints inherent in each system. We support this endurance requirement with systems such as diesel power supplies, and dispersal and reconstitution plans for people and equipment. When available, lithium batteries will also enhance the endurance of our Minuteman missile. Our goal is to provide maximum cost-effective endurance of strategic systems to provide the NCA with force employment flexibility.

AIR FORCE LENGTH OF WAR REQUIREMENT

Senator LEVIN. [Deleted] what is the Air Force's "length of war" requirement, how was it determined, and how does each system in the Triad satisfy it, based on the same characteristics referred to in the previous question?

General ALLEN. [Deleted] National policy does, however, require a high degree of flexibility and enduring survivability to counter enemy actions across the conflict spectrum. In developing systems to support the Triad, we strive to build in

as much endurance as possible consistent with physical constraint inherent in each system.

SOVIET LENGTH OF WAR REQUIREMENTS

Senator LEVIN. Do the Soviets have "length-of-war requirements" for their strategic forces, what are they; and how does each system in their Triad satisfy them, according to the previously-mentioned characteristics?

General ALLEN. [Deleted.]

ENDURANCE OF SOVIET TRIAD ELEMENTS

Senator LEVIN. What is our best intelligence estimate as to how long each system in the Soviet Triad actually will endure as an operationally useful system, based on our most likely efforts to defeat them, and why?

General ALLEN. Any estimate of Soviet force endurance is extremely dependent on the specific scenario envisioned. Assumptions concerning factors such as strategic and tactical warning, Soviet first strike composition and effectiveness, and Soviet forces withheld would have to be made. Any number of scenarios could be constructed, each worthy of extensive study.

Planned U.S. force improvements are designed to erode and negate the endurance of Soviet strategic forces. This will be accomplished by increasing and maintaining our capability to attack and neutralize each of the USSR's force elements.

STRATEGIC C³

Senator LEVIN. Our strategic command, control and communications (C³), rather than being considered superb, are now considered [deleted] vulnerable. According to the Joint Chiefs of Staff (JCS) Connectivity Study, [deleted]. Even if we implement the identified fixes to our strategic C³ system, it is not expected that the [deleted].

Doesn't this [deleted] vulnerability of our strategic C³ system, even in its improved condition, negate any "enduring usefulness" you could attempt to build into any ICBM system?

General ALLEN. Our ICBM systems are, in a practical sense, only as endurable as our means to command and control them. While our ground-based strategic C³ systems are [deleted] vulnerable to destruction, the vulnerability of our airborne strategic C³ assets is less predictable. For example, the Joint Chiefs of Staff estimate that at least [deleted].

Theoretically, airborne command control aircraft have the mobility to endure in a trans- and post-attack environment. Our current airborne command control aircraft have several limitations, but aircraft could be developed that would have an increased probability of enduring. If these aircraft could land at austere locations that provide a safe environment and relaunch when that location is threatened, then a significant portion of our strategic C³ system could endure. They could direct the employment of our strategic weapons systems if survivable warning and communications satellites were available.

It is essential that our future development and deployment of endurable strategic weapons systems include concurrent development and deployment of strategic C³ systems that are equally endurable.

LEVEL OF SOVIET WARHEADS

Senator LEVIN. Against what level of Soviet warheads is the baseline MX program designed, with and without SALT II?

General ALLEN. The baseline MX was designed against a [deleted]. However, the MX system is sufficiently resilient to provide adequate survivability and military effectiveness against a wide range of expanded Soviet threats.

THREAT LEVEL

Senator LEVIN. When was that threat level selected as the threat against which the baseline MX program is designed?

General ALLEN. The Soviet threat level against which the baseline MX program is designed was determined during the 1978/1979 Defense Acquisition Review Council cycle and at the time of the MX Full Scale Engineering decision in late 1979.

CURRENT ESTIMATE OF THREAT LEVEL

Senator LEVIN. What is the current estimate of the threat level by the time baseline MX program reaches full operational capability?

General ALLEN. The most likely 1990 SAL-constrained estimate gives the USSR about [deleted] accurate warheads. In the extreme case of a complete SAL breakdown, the most likely 1990 estimate is approximately [deleted] warheads.

MX FSED EXPENDITURES

Senator LEVIN. Please provide an MX FSED expenditures chart by program component, but allocated between missile and basing mode work.

General ALLEN.

FISCAL YEAR 1982 MX FUNDING

[In millions of dollars]

	Missile	Basing	Total
R.D.T. & E. (total).....	1,345.8	1,062.9	2,408.7
Propulsion.....	411.1		411.1
Guidance and control.....	400.4		400.4
Reentry systems.....	93.2		93.2
Mechanical systems.....	125.4	339.0	464.4
Electronic systems.....		263.1	263.1
Performance and software.....		65.3	65.3
Civil engineering.....		77.4	77.4
System test.....	163.6	88.1	251.7
Vulnerability and hardness.....		68.9	68.9
Deployment.....	36.5	46.4	82.9
Renewable energy sources.....		25.6	25.6
Logistics support.....		1.8	1.8
Engineering support.....	48.9	45.2	94.1
General support.....	61.8	34.7	96.5
AFTEC support.....	4.9	7.4	12.3

CONTRACTS AND COSTS AFFECTED

Senator LEVIN. What number of contracts, and what dollar amount, would be affected by a change in basing mode if that is decided by the new administration? What would be the dollar and time costs of changing, or canceling these contracts?

General ALLEN. In fiscal year 1981 there are 29 contracts directly related to the horizontal multiple protective shelter (MPS) concept. We project that about \$696 million will have been obligated on these contracts by the administration's June 1, 1981, target date for completion of the M-X basing review. Because of the 29 contracts have penalty clauses, total Government obligations resulting from a June 1, 1981, change to a different basing concept would be \$732.3 million.

Although the amount of time lost would depend on which alternative the Administration selected, it appears that only relatively minor changes could be tolerated within the current schedule. Significant changes, such as selecting a vertical MPS configuration, would delay the system by at least one year.

BEST AIR FORCE INTELLIGENCE ESTIMATE

Senator LEVIN. What is the AF's best intelligence estimates as to when the Soviets, because of the ongoing pace and composition of their strategic nuclear weapons and the expected pace/composition of U.S. strategic programs, will be forced to breach either SALT I or SALT II constraints, or both? On what is this estimate based?

General ALLEN. Because they can meet their mission requirements within SALT I limitations, the Soviet Union has no reasons to "be forced to breach either SALT I or SALT II constraints." We do not have any evidence to indicate that the Soviets plan in the near-term to build beyond their current force level of some 2500 strategic nuclear delivery vehicles. However, we do not expect them to reduce from their current force level to the SALT II level of 2250 by the end of 1981 unless the SALT II Treaty is in full force. We expect the Soviets to continue their ongoing force improvement programs within SALT constraints which will result in their reaching the SALT II sublimit of 1200 MIRVed launchers [deleted]. We have also identified at least four follow-on or modifications of existing Soviet ICBMs under development.

QUESTIONS SUBMITTED BY SENATOR JAKE GARN

MX RESPONSE TO A SOVIET BUILDUP

Senator GARN. Dr. Zeiberg, under the proposed action, what would be the U.S. response to a build-up in the number of Soviet missiles and warheads per missile? What assurances do we have that with MX we would not be overwhelmed in an arms race? As a practical matter, at what point would we have to resort to an ABM defense of some kind?

Dr. ZEIBERG. Our first response to an increase in the threat to MX would be a proliferation of empty shelters within the initial deployment area. This allows for an expansion from 4,600 to about 7,000 shelters. We might augment that action with deployment of additional MX missiles if we determine that is necessary to assure survival of the required number of missiles. If the threat escalates even beyond the capacity of these actions to counter, we could then expand the system in terms of shelters and missiles until political or geological limits are approached. At any time, we could accelerate development and deployment of a ballistic missile defense (BMD) system that has the effect of doubling the number of shelters as well as the rate of deployment of new shelters. These options provide the necessary assurance that MX would not be overwhelmed in an arms race.

CBO ANALYSIS OF MX

Senator GARN. We would like your comments on the cost concerns related to MX expressed in the CBO study dated January 1981, and entitled "Resources for Defense: A Review of Key Issues for fiscal year 1982-1986."

Would you comment on the validity of CBO's analysis of higher Soviet threat cases, particularly as it relates to the cost of a U.S. response?

Dr. ZEIBERG. The cited concerns have to do with the increased costs of expanding MX in response to an escalation in the threat. Our concern is not that costs increase, for that is inevitable if you are going to counter a new threat, but that costs increase in a cost-effective manner. Given that the threat may continue to increase, we would be well served to select a basing mode that offers resilience to threat increases. A good example is the resilience offered by the baseline MX MPS basing mode. We thoroughly studied its ability and cost to meet increased threats last year and reported the results to Congress in our April 1980 report entitled MX/MPS Survivability Against Increasing Soviet Threats. Without reaccomplishing those analyses using the different threat levels and assumptions used in the CBO's analysis, it is difficult to assess its validity. The one case that best allows an apples-to-apples comparison was the maximum threat addressed in our report to Congress. Converted to the fiscal year 1982 dollars used in the CBO study, we reported a total acquisition cost for that case of about \$67 billion versus \$78 billion in the CBO study. We do agree that application of ballistic missile defense reduces the cost of our response.

CBO BASE-CASE ANALYSIS

Senator GARN. How well do the cost elements associated with CBO's base-case analysis fit with DOD's assessments?

Dr. ZEIBERG. There is little matchup of CBO's base-case analysis with our assessment. The CBO study starts with a lower threat, uses more shelters and missiles, and costs about \$8 billion more in fiscal year 1982 dollars.

MX DEVELOPMENT OPTIONS

Senator GARN. Dr. Zeiberg, as to deployment options, what has been DOD's approach to the review of MX basing options? Two, what was the basic purpose of the review? Three, what new studies were carried out, and what basing options did they involve? Four, what new analysis was carried out to test earlier assumptions or existing data? Five, when do you anticipate completion of the baseline options analysis? Six, how would DoD presently rank its basing preferences in terms of the four or five most viable options?

Dr. ZEIBERG. We are proceeding with a vigorous and thorough review of MX basing options and will make a final decision by July 1. While conducting this review, we will continue to pursue the baseline MX program. A final judgment by July 1 will permit a thorough technical and policy review, yet maintain the current program schedule. This timing also enables us to consider adequately public comments on the MX draft environmental impact statement. I believe that more detailed comment at this time would be inappropriate.

LITIGATION IMPACT ON IOC

Senator GARN. Dr. Zeiberg, to what extent could litigation or legislative problems associated with provisions of the Engles Act, FLEPMA, NEPA or other laws affect the IOC? Two, what remedies is DoD contemplating? Three, what costs would be associated with such delays? Four, in the event they (above) become necessary, what methods for fast tracking MX are available?

Dr. ZEIBERG. We are proceeding with a vigorous and thorough review of MX basing options and will make a final decision by July 1. While conducting this review, we will continue to pursue the baseline MX program. A final judgment by July 1 will permit a thorough technical and policy review, yet maintain the current program schedule. This timing also enables us to consider adequately public comments on the MX draft environmental impact statement. We are examining the subject you have asked about, as part of that review, so I must withhold further comment until it is completed.

PRIVATE VERSUS PUBLIC LAND

Senator GARN. Dr. Zeiberg, would you comment on the observation that it would be significantly less time consuming to condemn private lands for MX purposes than to withdraw public lands for MX use. In terms of meeting the IOC, what advantages or disadvantages would be associated with deploying a significant portion of the MX system on private lands?

Dr. ZEIBERG. The observation is correct. Strictly in terms of meeting the IOC, therefore, there is the advantage of relieving the current schedule pressure on achievement of IOC. Disadvantages include the reality of many condemnation proceedings and the extra expense of acquisition.

QUESTIONS SUBMITTED BY SENATOR ROBERT DOLE

IMPLEMENT TITAN II RECOMMENDATIONS

Senator DOLE. On January 6, 1981, the Department of the Air Force released the Titan II Weapon System Review Report in which dozens of recommendations were made for safety improvements in the Titan II missile system. (1) What steps have been taken to implement these recommendations? (2) Which recommendations are planned to be implemented? (3) Which of the recommended improvements would require legislation to enable implementation, and (4) what legislation would you favor? (5) What is the time frame for implementation of the recommended improvements?

General ALLEN. The Titan II review groups offered some 300 recommendations to increase the margin of safety and insure the future supportability of the Titan II system. I have asked General Ellis, Commander-in-Chief, Strategic Air Command, to serve as the focal point for reviewing and consolidating the recommendations and developing a cohesive implementation plan. The Strategic Air Command (SAC) report should be completed by mid-March 1981. It will include a prioritized list of approved recommendations, a tentative implementation schedule, and cost estimates.

In the meantime, some 31 recommendations have already been implemented. These are primarily procedural changes to improve supervision, training, maintenance methods, and emergency planning. Other improvements are underway while SAC continues its review of all the recommendations. Legislation will be required to implement the proposal for hazardous duty pay for propellant technicians. I would favor legislation similar to that recently introduced by Senator Pryor and Representative Glickman, which would give the Services broad authority to identify specific occupations warranting this pay. Some other proposals may also require legislation; however, until SAC completes its review and prioritization, I cannot say what sort of additional legislation will be required.

COST OF IMPLEMENTATION

Senator DOLE. What will be the cost of implementation of these improvements? What further funding are you requesting for implementation of these improvements?

General ALLEN. Strategic Air Command headquarters is in the process of reviewing and prioritizing all the recommendations from the various safety review teams that were formed after the Titan accident. As a result, we do not have final cost figures for all of the improvements. Based upon the preliminary data we do have, the Air Force's best estimate of costs to date is approximately \$53 million. As the prioritization and evaluation process continues, these numbers will be verified and appropriate adjustments made.

Funding actions have been initiated for fiscal year 1981 and fiscal year 1982, and budget years. In the fiscal year 1981-82 Supplemental/Amendment, \$5 million and \$7 million respectively, have been requested for Titan II safety and service engineering requirements.

QUALITY OF TITAN II SILOS

Senator DOLE. It has come to our attention that certain structural components of the Titan II silos may not meet quality standards. As an example, it is alleged that welds on the walkway between the silo and the control rooms are of such low quality that they could not withstand a severe shock. If these welds did not hold, the walkway would collapse, severing the cables running from the control rooms to the silo. It is also alleged that quality and safety are being sacrificed to save rebuilding costs.

Is this example indicative of a quality problem in the construction of the Titan II silos?

General ALLEN. Throughout the construction of Titan facilities, and now with the restoration of the site near Rock, Kansas, applicable construction industry codes are observed. Welders—and their procedures and materials—fully meet industrial certification standards and the performance of the constructed facilities reflects quality construction.

During the relatively long life of Titan, few weld failures have been encountered and those failure have not been catastrophic. The singular weld failure at the site near Rock, Kansas, is not typical of the Titan system.

ADDITIONAL FUNDING NEEDED

Senator DOLE. Is additional funding needed to insure adequate quality and dependability?

General ALLEN. Quality and dependability are currently assured through the application of recognized construction industry standards. In the specific case of the restoration of the site near Rock, Kansas, existing contract provisions are adequate and we do not foresee a need for additional funds. If, however, unforeseen site conditions justify additional funding, this need will be addressed in our military construction program request.

STANDARDS AND GUIDELINES

Senator DOLE. What standards and guidelines are followed in judging the quality of construction at the Titan II silos?

General ALLEN. The standards and guidelines contained in Strategic Air Command Civil Engineer Manuals, that describe in detail methods and procedures used by the contractor, are largely used.

Work common to the manufacturing/construction industries is governed by the standards published by various societies and recognized by enforcing government agencies and industry itself. For example, the standards and guidelines published by the American Society for Testing and Materials, National Bureau of Standards, American Concrete Institute, American Institute for Steel Construction, American Welding Society, American Society of Mechanical Engineers and The National Electric Code are used in contract documents to establish and enforce quality standards.

In construction areas where highly professional technical skills are required, consultant services for work inspection and structural/site investigations are obtained from the Omaha District, Corps of Engineers and local testing laboratories.

REPLACE TITAN II MISSILES

Senator DOLE. Has the Air Force studied the options in replacing Titan II missiles while continuing to use the Titan II silos? If so, what are those options?

General ALLEN. We have studied the options and believe that there is no urgent need to replace our Titan II missiles. Our detailed reviews of the Titan II system following the accident at Damascus, Arkansas, last fall have convinced us that the Titans are fundamentally safe and supportable, and with the implementation of certain maintainability and safety modifications now under way can be kept that way for the foreseeable future.

The Titan II, with its high yield, substantial alert rate, and rapid reaction capability, makes unique contributions to our strategic deterrent. I believe that it should be retained in our force structure for the present and that its eventual disposition should be considered within the framework of our overall strategic force modernization programs and the evolving character of the strategic balance.

TITAN II SILOS HOLD OTHER MISSILES

Senator DOLE. Can the Titan II silos reasonably be modified to hold other missiles?

General ALLEN. Yes, however, extensive modifications would be required to silo components (i.e., thrust mounts, missile umbilicals, environmental control systems) as well as major modification to the launch control and monitoring equipment.

BUILD MORE TITAN II MISSILES

Senator DOLE. Last year the Secretary of Defense, Harold Brown, and the Secretary of the Air Force, Hans Mark, indicated there are plans to replace the Titan II with the MX, a solid fuel missile. If, in fact, the Titan II continues to "remain a useful part of our nuclear strategic deterrence" as the Secretary of Defense and the Secretary of the Air Force have stated and their comments support the reliability of liquid fuel rockets, then why are we going to replace them? Why don't we build more of the Titan missile?

General ALLEN. The Air Force has no plans to replace the Titan II missile with MX in the existing Titan II silos. MX could be viewed as a replacement for Titan II in the sense that Titan II phase out could begin when the deployment of MX in survivable basing has restored the required level of retaliatory capability to our ICBM force. Thus, the eventual disposition of Titan will be considered within the framework of our ICBM force modernization plans. In the interim, Titan II continues to contribute significantly to our deterrent posture.

REPLACE TITAN II WITH MX

Senator DOLE. Why are we planning to replace the Titan with the MX, a solid fuel missile carrying a smaller warhead?

General ALLEN. The Air Force has no plans to replace Titan II with MX per se. The MX will have throw weight capability nearly the equivalent of Titan II. will carry 10 warheads, will have much improved accuracy, and will have solid fuel propellant conducive to mobile operations. As MX is deployed in survivable basing and the retaliatory capability of our ICBMs is restored, consideration can then be given to phasing out the Titan II system.

TITAN II SPARES

Senator DOLE. One of the major criticisms I continue to hear about the Titan missile is that it is becoming increasingly difficult to obtain spare parts in maintaining the system in an effective and safe status. What are the problems surrounding the current status and the future plans regarding spare parts for the Titan II?

General ALLEN. The problems can be broken down into three broad categories—vendor availability, designed high reliability and small quantity buys. Due to the age of the system, many of the weapon system subvendors have either gone out of business or no longer make the required item. This is especially true in piece part replacement items of major subassemblies. Because of the high alert requirements of the Titan II weapon system, the engineering design effort was concentrated on high reliability. This designed high reliability resulted in low usage of certain repair parts with the ultimate result of dropping many of them from the supply system. Finally, because there are only fifty-four Titan launch facilities, the repair parts quantities are usually small and vendors are reluctant to bid on such small buys.

As original parts become no longer available, suitable substitutes are identified and qualified. In instances where manufacturing techniques have changed so that even substitute parts are not available, new state-of-the-art subsystems or replacement parts are engineered and incorporated into the system. The degree to which the Air Force has been successful is demonstrated by the constant high alert rate.

TITAN II CANNIBALIZATION

Senator DOLE. Has the Air Force ever taken from one missile to repair another because of lack of spare parts?

General ALLEN. Yes, but infrequently. During the period January 1980 through January 1981 there were sixty-four instances where repair of a Titan II missile was delayed due to a lack of parts. In only one of these cases was cannibalization necessary, equating to a cannibalization rate of about 1.6 percent. That indicates that the logistics system is providing adequate support to the Titan II weapon system.

FUNDING FOR TITAN II SPARES

Senator DOLE. What kind of funding has the Air Force requested with respect to maintaining a sufficient Titan II spare parts inventory?

General ALLEN. The President's fiscal year 1982 budget requests \$2.6 million for replenishment spares and \$1.7 million for support equipment. We believe this level of funding will adequately meet system requirements through the current funding period.

HARDEN TITAN II SILOS

Senator DOLE. Since 1973, the Titans have been targeted primarily on [deleted]. According to the Pentagon, such targets would not be the first to be hit by U.S. ICBMs, particularly under President Carter's newly approved strategic doctrine, which calls for hitting military targets [deleted].

Based on this policy, the Titans would thus have to survive any Soviet first strike against the U.S. We should also be mindful that we have never increased the cement hardness of the Titans silo. The Titan silos remain as they have since the 1960s, capable of withstanding pressure of a Soviet missile on only [deleted] psi. The Minuteman silos have twice been upgraded and can now withstand a blast of [deleted] psi.

General ALLEN. First, let me clarify that, while Titan is primarily targeted against [deleted]. To answer your specific question, in the late 1960s, when silo hardening programs were being developed for the Minuteman, the Titan was scheduled to be phased out within a few years. As a result, no program was initiated to upgrade Titan silos. Since that time, the Air Force has restudied both Titan retention and methods of enhancing ICBM survivability. We determined that Titan should be retained, at least for the next several years, and that its eventual disposition should be considered within the framework of our ICBM modernization efforts and the evolving character of the Soviet threat. In view of the increasing hard-target kill capability of Soviet strategic forces, we also concluded that increasing the hardness of Titan silos would not significantly add to their survivability.

Senator QUAYLE [presiding]. The subcommittee will be in adjournment.

[Whereupon, at 11:55 a.m., the subcommittee was adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

FRIDAY, FEBRUARY 27, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

SEA-BASED DETERRENTS

The subcommittee met in executive session, pursuant to notice, at 8:32 a.m., in room 224, Russell Senate Office Building, Senator John Warner, chairman, presiding.

Present: Senators Warner, Thurmond, Goldwater, and Levin.

Staff present: Rhett B. Dawson, staff director; Edward B. Kenney, Ronald F. Lehman, E. George Riedel, James C. Smith, and Frank J. Gaffney, Jr., professional staff members; Marie Fabrizio Dickinson, Frances B. Frazier, and Brenda K. Hudson, clerical assistants.

Also present: Chris Lehman, assistant to Senator Warner; Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Greg Pallas, assistant to Senator Exon; Peter Lennon, assistant to Senator Levin; and Willis Smith, assistant to Senator Jackson.

OPENING STATEMENT BY SENATOR JOHN WARNER, CHAIRMAN

Senator WARNER. Good morning, gentlemen. I will not take the time to read my statement. It will be put into the record, without objection, and we will just proceed with Dr. Zeiberg. We are in executive session.

[The prepared statement of Senator Warner follows:]

PREPARED STATEMENT OF SENATOR JOHN W. WARNER

This morning, the subcommittee meets to receive testimony from Department of Defense and Navy officials relating to the U.S. sea-based strategic deterrent and aspects of the fiscal year 1982 defense budget relating thereto. We welcome the return to our subcommittee of Dr. Seymour L. Zeiberg, Deputy Under Secretary of Defense for Research and Development, and Rear Adm. Powell Carter, Strategic and Theater Nuclear Warfare Division. We are also pleased to have Rear Adm. Frank Kelso, Director, Strategic Submarine Division, making his first appearance before this subcommittee.

As a former Secretary of the Navy, I have long been persuaded of the important role our sea-based nuclear forces play in preserving deterrence and maintaining the peace. We look forward to this morning's testimony regarding the steps that are being taken to maintain and modernize this vital component of our strategic forces.

As concerns have grown in recent years about the so-called "window of vulnerability" which will pose a threat to our land-based strategic forces during much of the decade of the 1980's, the reliance we must place on our sea-based nuclear systems to sustain our deterrent posture has increased commensurately. The need for a survivable submarine and SLBM combination, supported by an enduring, capable command, control and communications system to manage our SSBN/SLBM assets, is now, as never before, an urgent national priority.

Fortunately, needed modernizations of the sea-based leg of the Triad are well underway at this time. The Trident I missile, offering substantial improvements in range and accuracy over the missiles it replaces, has completed a highly successful test program and is now being retrofitted into a squadron of Poseidon submarines.

A replacement for aging Polaris and Poseidon submarines, the *Ohio*-class Trident submarines is in production. The introduction of these highly capable ships into the fleet will represent a significant enhancement of the operational flexibility and survivability of our SSBN's. Of concern, however, has been slippage in the delivery schedule of the lead ship, SSBN-726, following discovery of technical and workmanship problems. We are looking forward with considerable interest to today's testimony on the status of the *Ohio*-class construction program.

Several steps are also being taken to improve the command, control, and communication system which will manage current and planned strategic forces. Such actions are of major importance if we are to have a truly survivable and, therefore credible, sea-based strategic deterrent. This subcommittee will be devoting a full hearing to this issue on March 6 but will welcome any comments our witnesses may wish to make relative to C³ in the context of this morning's hearing.

Several programs now in development hold promise as further means of enhancing our strategic deterrent at sea. We will discuss with our witnesses the Trident II and nuclear land-attack sea-launched cruise missile programs with an eye toward reviewing their potential in this regard and funding decisions which will have to be made in the future if we are to realize their full promise at the earliest possible moment.

Gentlemen, you may proceed.

STATEMENT OF SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS)

Dr. ZEIBERG. Mr. Chairman, I have a prepared statement which I would like to submit for the record and in addition use as the guideline for my presentation this morning.

I am very pleased to have the opportunity to review with you today the most survivable leg of our strategic Triad. Your support and the committee's support for the SSBN and SLBM programs in the past has contributed to the U.S. maintaining a very robust deterrent and having a very capable war-fighting asset which stays many steps ahead of the Soviet countermeasures that we see emerging.

It is this stability of congressional support that has allowed for a corresponding stability in both our Government and industrial teams and, in general, a degree of stability which is unheard of elsewhere in our defense program. I think it is a situation in which all of us can take great pride and I look forward to that arrangement continuing into the future.

NUCLEAR SEA-BASED FORCES

We are prepared this morning to review all aspects of our nuclear sea-based forces. In my presentation, however, I would like to focus on two major decision oriented issues that are confronting us which will have to be decided in the next several months. In a sense this is a

forewarning of some things to come. Hopefully these will appear during the congressional cycle so that relevant authorization and appropriations actions can be taken.

Senator WARNER. Dr. Zeiberg, I would like to put in the record at this time the following. Our understanding is that the administration will come over on March 4 to discuss the amendments and then on March 10 with the President and so on. What is your knowledge of this?

Dr. ZEIBERG. That is consistent with what I have heard.

Senator WARNER. Dr. Zeiberg, do you wish to confirm that? You might indicate whether or not these decisions will be discussed at either one of those hearings.

Dr. ZEIBERG. It is not likely that we would preempt that. One is really a fiscal 1983 issue, but of great consequence. That is the issue surrounding the Trident II missile.

Senator WARNER. Yes.

Dr. ZEIBERG. It will take time to make that decision. The other, if action is taken, would likely come in via a supplementary procedure.

Senator WARNER. It won't be ready in time.

Dr. ZEIBERG. That pertains to any actions we might choose to take in connection with expediting delivery of the Trident submarines.

Senator WARNER. So neither of those decisions will be addressed at these hearings.

Dr. ZEIBERG. Correct. They will be addressed, perhaps with a little more insight, when the new Under Secretary for Research and Engineering appears in a strategic overview in about 2 to 3 weeks.

The path to follow in our next phase of SLBM modernization and the course of action to take to insure timely delivery of the Trident submarines are the two items I would like to discuss.

SLBM MODERNIZATION

First, in connection with the missile. Last year we submitted a report entitled "SLBM Modernization" to the Congress. Therein we outlined the rationale supporting further modernization efforts, the options available to us, and the recommended program. I would like to give you an overview update on that. It will be covered later in more detail in Admiral Kelso's presentation.

Second, let me note the highlights of the rationale for the next phase of our modernization. There are five essential ingredients there.

First, we can enhance SSBN survivability.

Second, we can minimize the total cost of our sea-based missile force by another degree of modernization.

Third, we can balance the capabilities of the Triad.

Fourth, we can take a large step in restoring the margins of safety in our strategic balance.

Fifth, we open up opportunities for flexibility in arms control negotiations.

I would like to address a few technical features of those points.

First, in connection with enhancing SSBN survivability the issue centers around the patrol area available to the Trident submarine as a function of the range of the missile it carries.

The first graph will depict areas available to us today and what they could be in the future.

[Graph deleted.]

I will point to the relevant zones. The dark red zones here in the North Atlantic, Mediterranean, and a slice in the Pacific represent the areas available to today's forces. The Atlantic and Mediterranean areas are when Poseidon patrols and the Pacific area corresponds to the patrol area of the Polaris submarines based out of Guam.

The lighter red area, which is worldwide, represents the area available to the Trident submarine. This is based on a missile having a range of about [deleted] miles.

The relevant numbers are about [deleted] square miles for today's force and about [deleted] square miles for the Trident submarine with the long-range missile.

The missile we are currently deploying in some of our Poseidon submarines is the C-4. It does have the capability to go [deleted] nautical miles. However, we have to remove about [deleted] of the warheads it carries to do so.

Consequently, if we find the need to patrol that large an area in response to Soviet antisubmarine warfare efforts we would have a virtual attrition of our force by having to offload [deleted] of the payload. Consequently, there is a rationale to modernize in the spirit of having that full range with a full payload. That is point No. 1.

C-4 MISSILE

A larger missile with more payload will allow us to reduce the total weapon system cost by effectively reducing the number of submarines we need to deploy. As an illustrative example, if we deploy the C-4 missile in the Trident submarine and maintain the current nominal level of launchers; namely, about 650 launch tubes, we need about 27 submarines. The cost of the submarines, the missiles, and the associated support is about \$38 billion in today's dollars.

If we build a missile that fills the entire launch tube envelope of the Trident submarine, we would only need about [deleted] submarines to get the equivalent firepower and the cost would be in the \$32 billion category. That includes the approximately \$8 billion in fiscal year 1980 dollars necessary to develop such a large missile.

So even with that nonrecurring cost built in, that investment cost built in, there is looming ahead of us in the next roughly 15 years, which is the time it would take to deploy such a force, a savings of about \$6 billion even after paying for the large R. & D. cost of the new missile.

The third point I noted earlier; namely, balancing the Triad, pertains to adding hard target kill capability to the sea-based force.

The next graph indicates some relevant technical factors.

[Graph deleted.]

Senator WARNER. Before we proceed with that I want to try and refresh my memory. I recall vividly the iterations that we went through to arrive at the Trident submarine but my memory is dim with respect to the missile.

TRIDENT MISSILE

At that time we looked at these iterations, which was about 8 years ago, did we have the technology to build a missile like Trident I or Trident II at that time or has it all come about since that period? Why didn't we go right into a more advanced missile at that time?

Dr. ZEIBERG. There was considerable technical uncertainty in the Trident I missile itself. We were developing a new class of propellant. We had some trouble in the initial development but subsequently it became a very successful program. So there was a technical risk associated with building any missile using those propellant and material combinations. The larger you would make it the more risky it would be.

Then there was a question of the availability of the Trident submarine paced to the availability of a missile. There was a risk in that we didn't have the confidence that the submarine would arrive at the same time the missiles would. If we went ahead with the bigger missile we might have a missile that had to wait for the new submarine and we would have lost the opportunity to enlarge our patrol area using the existing submarines.

Originally, as I recall the decisions, there was a two-step program. We would head in the direction of the C-4, which was conceptually an interim step, and then shortly thereafter proceed with the D-5, the larger missile as soon as it was clear that the submarine would be built on schedule. We would then have a rapid deployment capability with the larger missile.

Events turned out somewhat differently. The submarine was delayed, as you know, as was the D-5 missile. The schedule as it now exists is quite different from when it was conceived 10 years ago.

Senator WARNER. Thank you very much.

Dr. ZEIBERG. By the way, the step of deploying the C-4 in the Poseidon submarine allows us to go from [deleted] square miles of patrol area to about [deleted] square miles by fully using the Atlantic Ocean. So we did make a very major quantum jump in that first phase.

Back to the hard target capability. During the last several years a program called the improved accuracy program has been conducted by the Navy to develop the technology to support considerable accuracy improvements for SLBM's. Both the missile accuracy improvements and submarine accuracy improvements, that is submarine navigation, were considered. We can now see the possibility of obtaining CEP's comparable to what we could obtain in land-based forces.

The consequence of that is indicated on the graph which shows the probability of killing targets on the vertical scale. Two different kinds of targets are shown. The one on the left is a silo class, [deleted] psi hard, and the one on the right, [deleted] psi, corresponds to command centers, C³ nodes and so on. The function on the horizontal axis is the accuracy or CEP.

The C-4 and its predecessor the C-3 are in the [deleted] CEP category. The C-4 is actually performing considerably better during its initial testing. It is showing a CEP in the vicinity of [deleted] but we have a limited testing base.

The technology developed by the Navy indicates CEP's in the [deleted] range with confidence being higher in the [deleted range] and somewhat lower confidence in the [deleted] range. So if we can, just as an illustration, pick a midpoint in the [deleted] range and go to a medium-sized warhead, something like the [deleted] with a yield of [deleted] then we have a relatively high probability of kill against a silo class target. We get somewhere in the range of [deleted] percent probability of kill which is typically the range around which the force is structured.

[Deleted.]

TRIAD

The suggestion then is that the merging technology for accuracy of SLBM's, combined with a somewhat larger warhead than we are capable of carrying in our current missile designs, can add a new dimension to the Triad. That is, we can have a prompt hard target kill capability on the SLBM's which would then give us that capability in sea based systems as well as land based systems. The bomber force gives us that hard target capability but in a delayed context. It takes 8 hours to get the cruise missile there.

So by going into another degree of modernization we can equalize the capabilities of the Triad and thereby hedge our capabilities in a fuller sense. That is a very desirable posture to be in because we then become less vulnerable to any adverse developments in any one Triad element.

Senator WARNER. What is the time from launch to contact for a D-5, for [deleted] miles?

Dr. ZEIBERG. It is roughly about [deleted] flight time, or maybe [deleted].

Senator WARNER. Is it comparable to the land-based ICBM?

Dr. ZEIBERG. It would be comparable, yes. The one merit of the sea-based system, of course, is that you can have forces close in as well as far out. The close-in forces can have ultrafast response and you could deliver weapons within [deleted] from some of the close-in ranges and have a very effective initial strike. In the context of an early launch or even a launch on attack one could envision getting there before the Soviets know exactly how to regroup to refire their missiles or reload their silos and so on.

Senator WARNER. I would like to talk with you about that reload time. But, first, Admiral Kelso, after receiving an order to fire what is the time in which the SSBN force can be ready to fire its missiles?

Admiral KELSO. They are normally in a posture, sir, where they could be ready to fire in a normal position [deleted]. You could put them on an alert status where they were on a shorter string than that but you restrict the submarine's operating condition.

SUBMARINE PAYLOAD

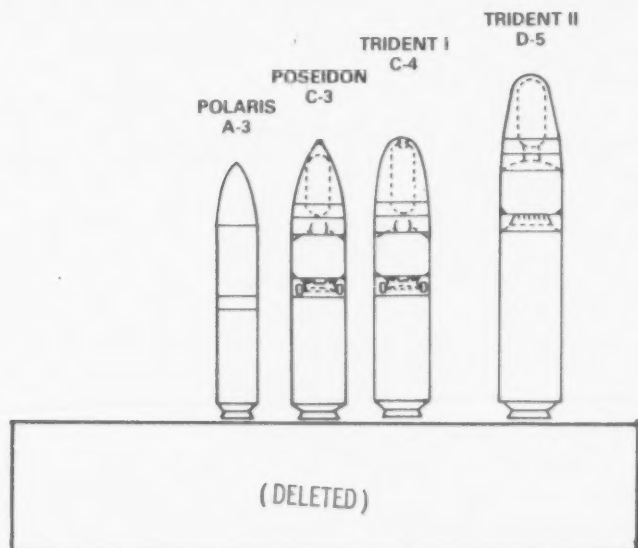
Dr. ZEIBERG. The other two points are somewhat more apparent. Namely, we could use the largest payload it is possible to deploy in submarines to aid us in restoring the margins of safety in our strategic balance, particularly in response to Soviet actions. This will soon

be deploying a submarine that is larger than a Trident submarine, the Typhoon, with an accompanying missile that is correspondingly large, so that the relative balance of sea-based forces will tilt in their direction once they complete their deployment program if we don't follow suit.

Then, finally, by having the most capable elements in our force we provide ourselves with negotiation flexibility for any arms limitation. The higher the unit capability, the more willing we would likely be to enter into some restrictions.

Now, the options we are pursuing are summarized on the next chart which also traces back into the earlier deployments.

SUBMARINE LAUNCHED BALLISTIC MISSILES



We are pursuing first an accuracy upgrade of the C-4. That is shown here with the current missile. It carries [deleted] warheads at [deleted] each and has a maximum range at full payload [deleted] miles. Here we are looking at the largest missile that we can fit into the launch tube of the Trident submarine. That could carry somewhere between [deleted] of these [deleted] warheads and [deleted] warheads.

The spread in payload is associated with a little uncertainty we have right now in how the propulsion technology will mature in the next 2 years. We are now achieving, as I said [deleted] accuracy with the C-4, although we expected about [deleted]. We believe we can get as low as [deleted] with the brand new missiles. In between those two options is stretching the C-4. We could increase the length of the first propulsion stage by about 10 feet and get an equivalent C-4 going to ranges of about [deleted] miles, but that would not allow us to put more warheads or larger warheads onboard because of the constrained volume in the front end. So that long C-4, as it is called, is somewhat of an interim step to give us more patrol area but not more firepower.

Shown here on the left are the earlier missiles. The C-3, currently deployed on some of the Poseidon submarines, and the Polaris A-3 which is in the process of being retired.

D-5 MISSILE

We are pursuing a program through fiscal 1983 which leaves all the options even though the underlying rationale and the emerging technical results all point in the direction of D-5 as the proper course of action to take. That opinion is now solidifying in OSD and the Secretary tends to agree with that. The only thing in our way is the approximately \$8 billion R. & D. price tag, about half of which is in the program and the other half of which is yet to be put into the 5-year defense plan. That will become an issue in the late Spring as we start the early planning for our fiscal 1983 budget.

Senator WARNER. That \$8 billion program is to go to the D-5?

Dr. ZEIBERG. It is the R. & D. for the D-5, yes, sir.

Senator WARNER. Just the R. & D.?

Dr. ZEIBERG. Yes. It does include more than the missile. It includes some submarine equipment to enhance the fire control system, as well as modifications of the launch tube. When we had to freeze the Trident ship design we had to freeze it around the C-4 missile. So there is money that would have to go into modifying the tubes, the mounting structures, and the associated fire control. There would also be some ship navigation related matters.

When you compare that with what we are doing with MX it is about the same when you count apples versus apples. The MX missile R. & D. bill that you may have seen is about \$5.5 billion in last year's dollars. However, that does not include the associated equipment that is parallel to the fire control system in the submarine. If you count in some of what is categorized as C³ on an MX and some of the launcher related developments then the two are about the same.

Senator WARNER. What are the production costs?

Dr. ZEIBERG. The production costs in my estimate would be about \$13 million a missile without warheads. Perhaps Admiral Clark can better answer that.

Admiral CLARK. I think that is approximately correct.

Dr. ZEIBERG. The cost of a C-4 missile is about \$8 to \$9 million. The cost tends to scale directly with the size. The cost of an MX will be close to \$15 million. It is a somewhat larger missile.

This discussion was in the spirit of giving a heads up to an issue that will be large and, even though it is a 1983 matter, it will creep into further testimony we have this year in anticipation of future budgets.

Senator WARNER. Thank you, Dr. Zeiberg. You may continue now.

TRIDENT SUBMARINE CONSTRUCTION

Dr. ZEIBERG. Next I would like to discuss some features of the Trident submarine construction and give you a status report that indicates some areas we are pursuing which could require some broad programmatic action by the current Congress.

As you know, we have had troubles getting the submarine built over the years and there are three reasons that I can see as having caused that.

SHIPYARD PROBLEMS

First, there was generally a lack of appreciation of the difficulty associated with building such a large, complex submarine. All parties to that question could be faulted in varying degrees and had varying contributions to that problem.

Second, there has been, and I personally believe there still is, inadequate management, inadequate work force, and inadequate quality control at the shipyard. That has been a persistent problem there. The problem has been decreasing with time but it is still not fully solved.

Third, I believe there is an excessive workload at the shipyard which is getting in the way of getting the ships out in time.

The Navy is taking a considerably broad range of management actions to solve a lot of these problems but there is some inherent conflict that I perceive between the actions of the shipyard and our desires.

There is a question of the relative emphasis the yard puts on 688 class attack submarines versus the emphasis that is put on the Trident. That is a reflection of their business strategy. The nature of the contracts are different and their business strategy influences the output of the yard. They, in a sense, are financially better off by emphasizing the 688's than they are in emphasizing the work on the Trident.

Senator WARNER. Is the matter in litigation now? We had better be cautious here with respect to it. If it is in litigation this record then could be subject to subpoena.

Admiral PEEBLES. The matter is not in litigation. I think what Dr. Zeiberg had reference to with regard to the relative emphasis of business viewpoint of the company vis-a-vis the 688 and the Trident goes back to the 1978 85-804 resolution of the kind of situation that was stamped on the 688 at that time. That decision reformed the 688 contract such that the shareline was changed and made into a 50-50 split.

Senator WARNER. What was the year those contracts were given?

Admiral PEEBLES. The contracts for those ships were given I believe in 1973.

Senator WARNER. Yes; that is right.

Admiral PEEBLES. About that time for the flight 1 and the 690 through 699 and flight 2, 700 through 710.

The Trident shareline, on the other hand, he has not reached the point of hurting the company. He is still in a profitable position. That shareline that he is on is 85-15. So it is to his financial business posture advantage to emphasize the 688, as Dr. Zeiberg indicated.

Senator WARNER. This is a subject that is going to be debated rather fully on the floor of the Senate at the time we take the bill to our colleagues. So we have got to be careful to put in a very good record. On the other hand, I don't want to do anything to jeopardize the Government should this matter go to litigation.

I will be asked time and time again as to why this program has slipped so badly and should this Nation go ahead and put more and more funds into this program. So let's sort of focus on what takes place on the floor of the Senate and work with the record as best we can.

I remember it very clearly. I will never forget the day I walked in to look at the mockup of this thing. We took every precaution known at that time to avoid the very things that have taken place. So the best laid plans have really gone awry.

Dr. ZEIBERG. Let me go on to first stress why we need to take some action to accelerate the productivity of the yard. I have five points I would like to put into the record to make it clear what I am expressing.

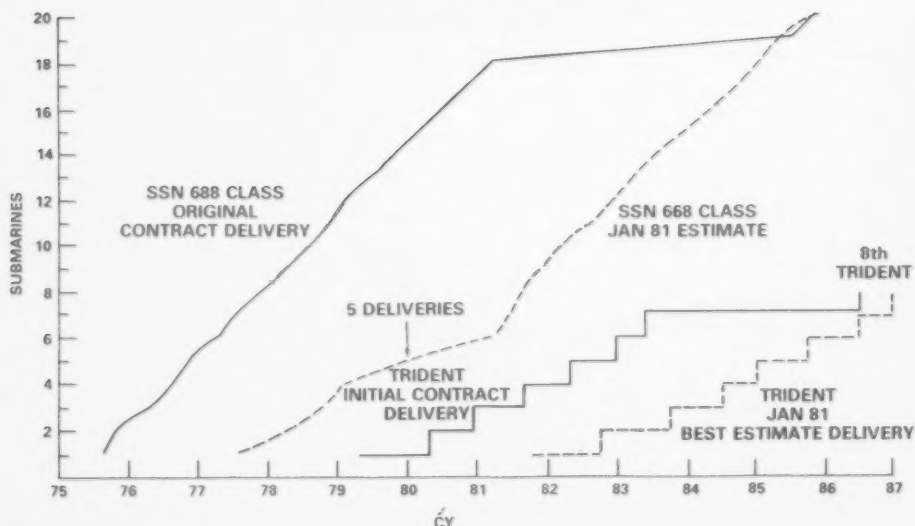
It is a general opinion in OSD, not just a personal opinion, that by letting the situation fester as it is in a sense, and perhaps that is an inflammatory word, we are paying dearly for the delays in the following areas. The cost of the system is rising. We are disrupting manpower assignments when skilled personnel are at a great premium. We have crews waiting for their ships at the shipyard and under other circumstances they could be more gainfully employed. We have uncertainty in our force planning. We planned Polaris retirement on the basis of Trident availability and now we will have Polaris retirement before we have Tridents on patrol. We are reducing our level of SLBM launchers, the curve dips, the familiar bathtub curves that you have seen in the past. Then, finally, we are delaying deployment of the submarine that will put a tremendous strain on the Soviet ASW capability which not only makes our SSBN's more survivable but it makes our entire fleet more survivable by diluting the Soviet efforts.

So clearly there is a strong motivation for us to get on with the program.

Senator WARNER. Let's set the framework here. What was the original target delivery date?

Dr. ZEIBERG. I have a graph that shows that.

ELECTRIC BOAT DIVISION CONTRACT vs ACTUAL/ESTIMATED DELIVERY DATES



The vertical scale shows the number of submarines delivered and the horizontal scale shows the calendar year. Red is for the 688 class submarines. The black is the Trident.

Senator WARNER. Fine. You have helped me enough.

LAG IN SHIP DELIVERY DATES

Dr. ZEIBERG. The original contract delivery date for the first Trident was in April 1979. There was a more conceptual delivery date somewhat earlier but nobody could quite believe the earlier date. That was more of a goal than a requirement.

Senator WARNER. Watch out with that statement. They might be able to go back and look in the record of these hearings were it was promised to the Congress it would be delivered and there was no modification that this was just a conceptual and theoretical delivery date.

Dr. ZEIBERG. I should call it the initial contract delivery. That was in writing. The rest was a target with no penalty for not achieving that. The Navy's current best estimate is delivery of that first ship late this calendar year. Personally I have no confidence in that date. I have been to the yard and talked with the manager of the construction there. I really can't get any confidence in any date. In fact, the last time he came to visit me to tell me about the status he came in with some more bad news and said something had been discovered the night before which would put an indefinite slip into the project.

Senator WARNER. When did this conversation take place?

Dr. ZEIBERG. A few weeks ago. Just before the turn of the year. That was my last conversation. It is hard to keep up when things are changing so fast. So this date is not very confident in my mind. The Navy engineers believe that is possible if things work well. The following ship will go out about a year later. By the fourth ship we will be approaching the target rate and, if things work well, by the eighth ship we will be back to a reasonable delivery rate. The red lines show what has happened with the 688 program with comparable slips.

Now, there are three general areas that we can pursue to help solve this problem.

One is to apply whatever skills we have to clean up the situation, so to speak, better management practices on both sides of the fence, more attention to the quality control and work scheduling, and so forth.

I am very impressed with what has happened on the Navy's side and, in general, on the contractor's side where considerable effort is being expended to pursue this. But there are some more dramatic steps that we have conceived of and are now discussing perhaps within a few months we can settle down on one.

One of these is probably not feasible and that is to add a second source for the Trident submarines. There is nothing like competition to solve problems like this. We have seen that in all of our programs and I think later this morning Admiral Locke may tell you about how competition has helped the cruise missile program.

Now, the problem there is that it is very costly and very time consuming to bring another yard onboard. The Trident is a very complex ship and we might suffer a disproportionate delay early on and only reap the benefits far out in time by which time the current problems might have solved themselves anyway.

A more feasible approach would be to add an additional source for the SSN 688 class of submarines. That could offload the 688 work at

the Trident yard and allow the contractor to apply his best and most skilled people to the Trident program in order to work down the backlog and get back on track earlier. That one looks more feasible and the Navy is now studying that. On first results it doesn't look as if there are very large startup costs for this nor would a lot of time be lost in doing it.

NONAVAILABILITY OF PRIVATE SHIPYARDS

There are some very complicated problems that come in because it appears that there is no private shipyard in a position to jump into that program. It would have to be a Government yard in which case we have a fair number of problems to confront, not the least of which is the manpower availability and the rearranging of overhaul work at the Government yard that would be selected.

Senator WARNER. That presumes that the second shipyard, which is Newport News Shipbuilding drydock, is at capacity with its 688 program, but that is not what is represented to me. Do they not have an additional absorption factor there for that program as opposed to going to a third yard?

Dr. ZEIBERG. I suspect they do. The question then would be do you want to invest all of the 688's in one yard and put ourselves in a comparable position to where we are now with the Trident.

Senator WARNER. This doesn't read that way. This says additional source of 688's, which I interpret to be three yards handling it.

Dr. ZEIBERG. Three yards total, yes. We would have the technical capability of three yards. We would have Electric Boat, Newport News, and a third yard.

Senator WARNER. You are sitting up here arguing the Newport News case for reasons obvious to all, but looking at this it appears what you mean is you need a third yard because the two existing are up to full capacity.

Dr. ZEIBERG. Well, Electric Boat is up to full capacity because of the circumstances there. I think we should let them work down their backlog before giving them any more business.

Senator WARNER. That I can understand. Then is the second source, namely Newport News, at a point where it cannot absorb more?

Dr. ZEIBERG. No. It can take on more work, but I would bring in a third yard to provide competition with Newport News and let Electric Boat work down the backlog before giving them more 688's.

Senator WARNER. What remains in the 688 building program in terms of numbers? How many are in the fleet today, how many under production, and how many funded and planned?

Admiral PEEBLES. I will supply that for the record.

Senator WARNER. What is the total program?

Admiral PEEBLES. I will supply that for the record.

Senator WARNER. So what is the balance? You have 11 in the fleet now; is that correct? You can supply that for the record.

Admiral PEEBLES. I will supply that for the record.

[The information follows:]

SSN 688 BUILDING PROGRAM

In the fleet today, Senator, there are 11. Six were delivered by Electric Boat and five were delivered by Newport News. Under contract and in production, there are a total of 22. Fourteen of these are with Electric Boat and the other eight are at Newport News. An additional four, in the fiscal year 1980-1981 program, are authorized and funded, but are not yet under contract. The fiscal year 1982 budget request includes two additional SSN 688's bringing the total to 39. [Deleted.] Both of these goals are minimum force levels in recognition of fact-of-life constraints. To reach and maintain a 100 SSN force level will require a building rate of three to four SSNs per year, beginning as soon as possible.

Senator WARNER. I think that looking at the option of a third yard is a major perturbation in the program that is probably well beyond its halfway mark. But that again is somewhat out of the realm of the purpose for this hearing so let's proceed.

Dr. ZEIBERG. That is very well put. The solution is aimed at the Trident problem which is very early in its phase. So this third yard, ostensibly put into the game to work on 688's, in the long term becomes another overhaul capable yard and another asset to the fleet in general.

Senator WARNER. I can't overemphasize the importance of this Trident problem when we go to the floor of the Senate because the President at the moment has got the momentum going forward for additional expenditures and this sticks out like a sore thumb for those who want to say that we cannot go but so fast in this country in our buildup and it flows over into the MX.

Dr. ZEIBERG. It was hoped by the new administration that this program could be accelerated but indeed it cannot be until about 1985 and only if we take some relatively herculean steps right now. You are very correct, this should and will receive a lot of attention in the next few months. I am hoping that we can come up with a plan to redistribute our workloads so that we can accelerate the program.

I am sorry to end on a down point, but that does complete the remarks I had planned to make.

Senator WARNER. We will have a further hearing of this subcommittee on the problems specifically relating to this higher class Trident contract. Part of that hearing will be in open testimony. We will refine further the reasons for what went wrong and the corrective measures recommended by the new administration. I anticipate it is a little early to pin down the new administration on those corrective procedures. So we will proceed on to the other aspects of this particular hearing and let it be clearly known that we are going to look into it.

Thank you.

[The prepared statement of Dr. Seymour L. Zeiberg follows:]

PREPARED STATEMENT OF DR. SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS)

Mr. Chairman and members of the subcommittee, I am pleased to have the opportunity to review for you the most survivable part of our Triad of strategic nuclear forces. Your past support for the SSBN and SLBM programs has con-

tributed to the United States maintaining a robust deterrent and warfighting capability which is many steps ahead of possible Soviet countermeasures. We look forward to continuing, productive interactions in order to provide a favorable national security program.

We are prepared to review all aspects of our program with you today. In these opening remarks, however, I will focus on two major decision issues of present concern. These pertain to the following: first, the path to follow in our next phase of SLBM modernization—this bearing directly on whether to proceed with the Trident II missile; and second, the course of action to follow in order to insure timely delivery of the Trident submarines.

In February 1980, we submitted a report entitled "SLBM Modernization" to the Congress. The report presented the rationale supporting further modernization of our SLBM's, the options available, and the recommended program. I would like to briefly review these items and give you an update on our plans.

First, the rationale for SLBM modernization may be summarized by the following five points:

- Enhance SSBN Survivability by increasing SLBM range at full payload to expand the total patrol area available to the Trident submarine.

- Minimize total weapon system costs by increasing SLBM payload to the level permitted by the size of the Trident submarine missile launch tube, thereby allowing mission capability to be achieved with a lesser number of submarines.

- Balance the Triad by adding hard target kill capability to our SLBM's.

- Return strategic balance with the Soviets in accordance with needs to increase our capability to offset their advances.

- Provide flexibility for arms control negotiations.

The missile options we proposed are as follows:

- An accuracy upgrade of the current C-4.

- A stretch of the C-4 first stage to increase range—but not payload because of the constrained front-end volume to emplace reentry vehicles. Accuracy would also be improved.

- A new large missile, the D-5, that fills the Trident submarine's launch tube. This missile would have much increased range, payload, and accuracy compared to the C-4.

The program we recommend and which we are vigorously pursuing emphasizes technology development in the propulsion and guidance areas through fiscal year 1983. This work will keep all of the options open. A final selection and commitment would then be made to enter full-scale engineering development in fiscal year 1984 with an IOC of 1989.

It is very clear that the underlying rationale for modernization, the associated effectiveness analyses, and the technology indications all point toward a new large missile such as the D-5. However, debate has arisen regarding the affordability of this missile—the R. & D. price is in the \$8 billion range. It is our position that cost/benefit arguments make it worth our while to plan our financing to allow D-5 development and deployment. This is not to say that it will be easy and careful planning is necessary. Proceeding with the D-5 missile will generate opportunities for significant savings to offset a large fraction of the \$8 billion R. & D. costs since, as I mentioned before, fewer submarines would have to be procured to achieve desired mission capability. Our immediate issue is to program money in the fiscal year 1983 POM to support the D-5 program in fiscal year 1984 and beyond. Right now the FYDP assumes that a C-4 accuracy upgrade will be pursued—a program costing less than half of a D-5 program, but providing a disproportionately lesser capability. OSD and the Navy will be working together on this planning to make sure we explore all means to provide support.

Next, I would like to outline the questions surrounding Trident submarine delivery and what we can do about it.

As you know we have had problems in getting the Trident built and delivered. The problems have been deep rooted and may be categorized generically as follows.

- Lack of full appreciation of the difficulty involved in building such a large, complex submarine. Both the government and the contractor may be faulted here, but to differing degrees.

- Inadequate management, work force, and quality control at the shipyard—a contractor problem which has reduced with time but is not yet fully solved.

- An excessive workload at the shipyard, considering the work force capabilities.

The Navy has been taking all appropriate management actions, but progress is influenced by many variables and is slow. The factors involved here are relative emphasis at the shipyard on the attack submarines—the 688 class—versus Trident; differing management perspectives between the contractor and the Navy; as well as the work force and workload questions noted earlier.

I have faith in the Navy's judgements on these matters, but at the same time I'm reluctant to count on the schedule for deliveries because I am not confident that all the factors can be controlled by the Navy.

No doubt the problem will solve itself eventually, but we cannot predict the pace. In the meantime we are paying dearly for the delays. In particular,

The cost of the system rises,

We disrupt our manpower assignments at a time when skilled personnel are at a premium.

We have uncertainty in our force planning,

We delay restoration of our SLBM launcher level,

We delay deployment of a submarine that will cause tremendous strains on the Soviet ASW efforts, thereby strengthening our entire submarine fleet.

Clearly, it is in our interests to seek ways to expedite deliveries. We have explored this in considerable detail and the following options become evident:

Improve current program management—this is being done to the extent possible.

Add a second source for Trident submarines by bringing another shipyard into the business. Our assessment of this approach is that the step is too costly and time consuming to be feasible—Trident is too complex a ship. Moreover, having two yards in the business would commit us to a construction rate of at least two Trident per year in order to maintain both a stable work force and competition.

Add an additional source for the 688 class of attack submarines (two shipyards are now active in this program). This could off-load the Trident shipyard from 688 construction, thereby allowing greater concentration of the work force on Trident. If this could be done in the near term, we could get Trident on-track and put ourselves in a position to build up to two per year, if desired, by 1985 with a high degree of confidence. (Our current program consists of three ships every 2 years starting in 1985.) This option looks feasible, based on preliminary results developed in a Navy study. The additional shipyard would, most likely, have to be adequate to support this action. However, adapting a government shipyard has many budgetary, personnel, political, and programmatic implications. For example, we would be obliged to produce at least three 688's per year, while the current program has only one per year through fiscal year 1985. We are continuing to study this option, however, to make a detailed assessment of its feasibility and its collateral benefits. In parallel, we will examine the force structure and affordability issues. I expect that conclusions will be available within two to three months.

This point completes my prepared statement.

Dr. ZEIBERG. Admiral Carter will now present to you some policy and requirements considerations germane to the sea-based nuclear deterrent forces.

STATEMENT OF REAR ADM. POWELL F. CARTER, JR., U.S. NAVY DIRECTOR OF THE STRATEGIC AND THEATER NUCLEAR WARFARE DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Admiral CARTER. Mr. Chairman and members of the committee, my name is Rear Adm. Powell Carter and I am the Director of the Strategic and Theater Nuclear Warfare Division. My area of responsibility relates to the translation of national nuclear policy into Navy requirements and also I act as primary adviser to the Secretary of the Navy and the CNO for all matters relating to nuclear warfare plans, policy and requirements. I am also responsible for international negotiations involving arms control.

My purpose this morning is to set the stage for the more programmatic presentation of Admiral Kelso by discussing what national policy requires of our strategic forces and what role the submarines can play in that. I will assess briefly our current force and mention some possible alternatives for the future.

I have a statement which I would like to submit for the record and then save time by just summarizing it quickly.

Senator WARNER. Fine. You proceed, Admiral Carter, as you wish.

PRESIDENTIAL DECISION 59

Admiral CARTER. The current national nuclear policy was set forth by Presidential Decision 59 which was signed on July 25, 1980. This document codifies the evolution of our national nuclear strategy from one of massive assured destruction toward a strategy that combines both countervalue and counterforce targeting into a countervailing strategy. It is believed that a more credible deterrent will result if the national command authorities are given the flexibility to respond appropriately at all levels of violence rather than be faced with a possible decision of no action or executing a massive strike against the Soviet Union.

The current Navy nuclear forces were designed in the fifties and early sixties when the national policy was one of massive assured destruction. They were designed to be survivable and enduring and have the capability to do unacceptable damage to soft Soviet urban and industrial targets. They still have that capability today and can carry out that mission very effectively.

UPDATING OUR NATIONAL STRATEGY

As the national strategy has evolved our forces have aged, and they now require modernization. So the central issue facing the Department of Defense and the Congress in the years ahead is what should be the characteristics of the new modernized Navy strategic forces. Should they continue to be oriented toward providing a survivable and endurable force whose effectiveness is limited to an assured destruction role or should they be able to have the ability to target across the full spectrum of Soviet targets?

The possible initiatives we have facing us in the near term are: (a) the development of new missile as a follow-on to the C-4, and Dr. Zeiberg has done an excellent job of covering those possibilities, (b) the backfitting of additional C-4 missiles into Poseidon submarines, (c) the retention of Polaris submarines in the strategic role, (d) the improvement of command control and communications facilities, and (e) an additional one which the Navy has really not considered primarily in a strategic role but which I have been asked to mention this morning and that is the inclusion of the Tomahawk land attack missile with a nuclear warhead, on submarines and surface ships in a strategic role.

In judging these various initiatives I think it is useful to have a set of yardsticks or measurements, and I suggest four: One, and the most important, is military effectiveness; additionally, what is usually referred to as essential equivalence and some refer to as perceptions; the

third would be stability and the final would be an "other" that would contain such things as environmental impacts, costs, risks, and sundry other items.

In the area of military effectiveness the countervailing strategy calls for a survivable and enduring force capable of holding at risk all Soviet targets.

Navy strategic forces today are survivable and enduring and we believe they will remain so for the remainder of this century at least and well into the next.

Recent analyses done by the CIA, the Rand Corp. under contract to the Air Force, and the Navy all come to the conclusion that our submarines are not threatened and will remain survivable as far into the future as can be perceived at the present time.

When it comes to the capability of the missile, however, we do need to modernize and do something different if we are going to be able to attack the entire spectrum of Soviet targets as has already been explained by Dr. Zeiberg.

In my prepared statement I gave unclassified graphics to show the kind of capability you buy by going to the various missile options. What we have done there is normalize at one for the most capable missile and then compare the other missiles to it. What that shows you is that you buy a tremendous increase in capability against both the moderately hard and the hard targets when you go to a D-5 type Trident missile. You also gain significantly against the soft targets.

The D-5 is more expensive than the other options, but the increased expense is only about 30-percent over the C-4 options and you gain well over [deleted] percent in capability.

Senator WARNER. Clearly with the vulnerability to the land-based system, and that being the primary system for short delivery time for hard target kill, this provides a very important redundancy.

Admiral CARTER. Yes, sir, it does. Of course, the advantages of the Triad are well appreciated but some people fail to extend that beyond having an assured destruction against Soviet cities and fail to appreciate that it also would be very advisable to have a hard target capability in more than just one leg because that increases stability by lessening the temptation of the Soviets to strike against a vulnerable leg feeling that they can remove an essential ingredient of the war fighting capability.

In the C-4 backfit area, installing C-4's into additional Poseidon submarines has been proposed. However, from a military effectiveness standpoint that does not buy you a great deal.

Backfitting the initial 12 submarines was good because you get increased range and you get considerably increased capability [deleted]. If you backfit additional Poseidon submarines it is going to cost about \$4 billion to do the remainder of the force [deleted].

As you can see from the graphics I gave you, there is not an appreciable increase in effectiveness [deleted] I would submit that from a cost effectiveness standpoint conducting additional backfits is not a reasonable way to go.

Senator WARNER. The only thing is there might be a timing factor there. We could achieve more hard target capability at sea quicker with a retrofit than we could going forward, or am I mistaken?

Admiral CARTER. Well, that was a point I was hoping to make in that we are going to complete the backfit of the 12. I think we are more than half way there now and the last one is in 1982.

Those 12 along with the C-4s on Trident will cover adequately [deleted] targets [deleted] you really aren't buying very much with additional backfits. We hurt in so many other areas of defense, those dollars could be spent better I think elsewhere.

We need improved command, control and communications, the C³ area, for our forces. Today we depend primarily on the Tacamo aircraft to provide assured communications from the National Command Authorities to our submarines on patrol, particularly during the early hours of the transattack phase.

We feel that those aircraft can do the job today providing the message gets to them from the National Command Authorities. However, they are aging, they have no growth capability remaining, they are overweight, and we don't have enough of them [deleted]. We need to do something about airborne command capability for the Navy.

An additional area that is very important to maintaining the survivability of our forces is to provide some way to break the umbilical to the surface so our submarines can use their full capabilities with regard to speed and depth.

As you well know, today our submarines are tied to the surface by the necessity of being able to receive a submarine broadcast which means [deleted].

[Deleted.]

Senator WARNER. So those still remain the only three ways and there has been nothing new in the last 6 or 7 years?

ELF COMMUNICATION SYSTEM

Admiral CARTER. No, sir. We do have of course a system that has been under development for some time called ELF that will allow us the capability to communicate with submarines at depth and at higher speeds.

The survivability of submarines is particularly important during the crisis phase just before a Soviet strike occurs because once conflict starts anti-submarine warfare, being a war of attrition, takes a long time to do. The period of danger is if the adversary can locate a significant amount of your force before hostilities start and then strike all at once.

Senator WARNER. Clarify how he can locate a significant amount of your force.

Admiral CARTER. He can't today, but there are technologies which we believe could [deleted].

[Deleted.]

Senator WARNER. With the evolution of technology there can be a major breakthrough to [deleted] what, 4 or 5 years?

Admiral CARTER. I don't know if it would be 4 or 5 years. We are running some tests [deleted] that will give us a better handle on whether it actually works or not. These things I am talking about now are technology that is on paper and it is hypothetical. Nobody has gone out and actually made something work.

Senator WARNER. But the Navy perceives a weakness in that area?

Admiral CARTER. The Navy perceives a very definite weakness in that area. We would like very much to get those submarines [deleted].

The ELF system, the extremely low frequency broadcast system which the Navy is proposing [deleted].

Senator WARNER. On that point, and I have been a strong supporter of the system and will continue to be, let's put in the record an answer to the question that is raised time and again on this debate. Fine, it will serve to enable you to remain under sea and improve basic communications. But on the initial strike ELF goes out and then you are back to where you were. Let's touch on that point.

TACAMO AIRCRAFT

Admiral CARTER. Yes; you are back to where you were in one sense, that you are back to using TACAMO aircraft. For example, when you have a submarine [deleted] right now or if we had the ELF system in the future we would have submarines at depth operating where they are not receiving broadcasts by any means other than ELF. As soon as the ELF was destroyed the submarines would lose that signal because there is a signal all the time when it is in operation. [Deleted.] [Deleted.]

Admiral CARTER. If you did not have ELF, as we are today, those submarines that are [deleted] operating at depth come up to copy [deleted]. If a surprise or bolt-out-of-the-blue attack that we worry about were to occur, [deleted].

Senator WARNER. That is a very good point. So, in that brief time frame, it will have served its purpose.

Admiral CARTER. Yes.

Senator WARNER. Apart from serving its purpose now of complementing this normal ASW training?

Admiral CARTER. Well, it is not only complicating that but again it is preserving—and this is very important in a time of crisis leading up to a conflict—it is preserving the position or it keeps the Soviets from knowing the position of those submarines and it gives us the confidence that the Soviets cannot take out a large portion of our force in a surprise coordinated attack.

Senator WARNER. Right. Does the technology lend itself to put in four or five small, simple ELF systems dispersed? Has that been looked at?

Admiral CARTER. That is my understanding.

Captain DONOVAN. Senator, I am Captain Donovan, the Deputy Director of the Naval Communications Division in the Office of the Chief of Naval Operations. I also serve as a program coordinator for the ELF. You can build small ELF systems in clusters in many locations. A dominant factor in the effectiveness of an ELF system is the underlying rock structure in the area that you build it.

Senator WARNER. I remember that.

Captain DONOVAN. Unique to our Nation and probably to the world is that upper Midwest structure known as the Laurentian Shield.

Senator WARNER. Right.

Captain DONOVAN. You gain advantages in less size and less environmental impact and less power and better performance and less cost through locating a system in this area.

Senator WARNER. So the constraint is geology?

Captain DONOVAN. Yes, sir.

Senator WARNER. Unique to the western continent.

Captain DONOVAN. The upper Midwest. Now, there are 30 or 40 other places in the United States with high-resistant rock, but not nearly in an order of magnitude equal to that in the Laurentian Shield areas.

Senator WARNER. Well, we were going to Texas at one time. Is that rock found down there?

Captain DONOVAN. It is rock found there but of lesser quality.

Senator WARNER. Here is a chart that has been handed to me showing the disposition of these rock formations, the most desirable being in Minnesota and Wisconsin.

Captain DONOVAN. There is some good rock in the upper part of Minnesota. That is very rocky country and it is very difficult to construct in that area.

Senator WARNER. That answers my question.

In other words, that option has been looked at of dispersing a number of smaller sites against some redundancy built in and it has been discarded and it is the Department of the Navy's desire still to go ahead with one major installation in the most desirable rock formation?

Captain DONOVAN. Yes, sir. However, that proposal includes two sites at this time which has some diversity in its locations.

Senator WARNER. Thank you very much. So there are two sites now under consideration. Where is the decision on that right now? Last year, we went through hearing after hearing. [Pause.]

That is right. By April 1, 1981, the President has to come forward with a recommendation. Is that correct?

Captain DONOVAN. Yes, sir. The Chief of Naval operations this week signed a recommendation to go forward again with the plan to the Secretary of the Navy. That is being reviewed within the Secretary of the Navy's staff at this time. We expect within the week to forward that decision on.

Senator WARNER. I presume that you prefer at this time not to put in the record the content of the recommendation of the CNO. I am not pressing for it because I know the sensitivity of it and I don't need to know right now. What is the Navy's position?

Captain DONOVAN. The Navy's position is to go forward with a small, austere two-site system, depending on funding, between 1985 and 1987, with full capability around fiscal year 1989.

Senator WARNER. Thank you. Can you accelerate it?

Captain DONOVAN. Fiscal year [deleted] is about the earliest that we would make [deleted] receivers on submarines with the small operational system.

Senator WARNER. The backfitting aboard the boats themselves is the major constraint?

Captain DONOVAN. Yes, sir. We have some research receivers that we have used in previous test programs which we could refurbish and possibly get out sooner but a modern production receiver and a capability [deleted] the earliest time.

Senator WARNER. In the electronics industry, it would take 5 years to build that receiver?

Captain DONOVAN. Yes, sir. It is a complex receiver with complex software coding and requirements for strong electromagnetic ruggedness.

Senator WARNER. Well, I will defer to your expertise that it is complex. There is a chapter of history, gentlemen, for the Congress control and not the Defense Department—this whole system.

All right, go ahead, Admiral.

Admiral CARTER. Yes, sir. Well, finally, in the military capabilities area and beyond it, there are problems of communications.

We do have some additional advantages in SLBM's in that they provide a great deal of flexibility not only in the various positions they can launch from but they have a very rapid retargeting capability providing the target packages have been pre-provided. They also have an ad hoc retarget capability [deleted].

Inherent in a mobile force is also the ability to respond to increased threats in a nonescalatory manner.

ESSENTIAL EQUIVALENCE

I would go on and talk for a moment about perceptions and essential equivalence. Essential equivalence is an area that uses static measures that are simplistic and very easy to understand. It is a very important area because it is the way that most of the world judges the U.S. strategic posture vis-a-vis the Soviet Union.

However, we should not let this particular attribute dominate the calculus of our strategic force mix. A good example of what perceptions or essential equivalence worries can do to you if you are not careful in the issue of retaining the Polaris submarine.

Perceptually it appears that in doing away with 10 of our Polaris submarines we are unilaterally reducing our seaborne force by 25 percent. When the Time magazines and Newsweeks of the world pile up the red submarines and the blue submarines it looks like we are doing something that is not very reasonable at all.

However, it is not the submarine or the launchers that threaten the Soviet targets. It is the re-entry vehicles. When you look at what capability we are losing in giving up the Polaris submarine as far as its actual military capability to do damage to the Soviet Union, it is very, very small and it is submerged within the larger force structure.

POLARIS SUBMARINE FORCE

For example, the total military capability of a Polaris submarine force represents less than 5 percent of the Navy's strategic effectiveness and less than 2 percent of the Nation's capability.

The additional cost of retaining those very old submarines and the very skilled people that we would have to leave on them during a period when we need those people to man up the Trident force just isn't worth what you gain by keeping those submarines. That is a story I guess we have to do a better job of getting across. I think it is a very important issue to put to bed. We should not retain those Polaris submarines.

Senator WARNER. That is for the strategic role?

Admiral CARTER. For the strategic role.

Senator WARNER. They may have another role?

Admiral CARTER. Yes, but not a strategic role.

A moment about stability. Submarine forces have a considerable capability to provide stability to strategic forces, not only long-term stability through its contribution to the Triad concept but in crisis stability in that it being an enduring and survivable force the Soviets do not have a capability to take those forces out and draw them down significantly by a surprise attack.

Of course, from an arms control situation, since they are not targetable they do not provide incentives for the Soviet Union to proliferate strategic forces to attack them.

In summary, sea-based systems are costly but when you look at the amount of survivability that you buy they are cost competitive with any other strategic programs.

D-5 PROGRAM

Now, the D-5 is by far the most cost effective of any of the options when you look at it on either a procurement or a 30-year life cycle cost basis. It is particularly cost effective if you take into account the full life-cycle costs.

The Navy's problem with the D-5 and why we haven't pushed it harder has been strictly one of affordability. The near-term R. & D. costs are very large, even though in the long run it will wind up costing the taxpayer less money than some of the other candidate systems. The Navy's budget has been stretched so thin across the board in past years that we just simply have not been able to devote the kind of money that we need to move ahead rapidly with the D-5 program.

Finally, the Navy can't offer, much as we would like to, any near-term solution to what some perceive as an imbalance that will occur within the next few years between the strategic forces of the Soviet Union and the United States.

Senator WARNER. I missed a word there. The Navy can or cannot?

Admiral CARTER. Cannot.

Senator WARNER. That is a very important statement. In this window of vulnerability you are being very candid that the Department of the Navy cannot offer any of the assistance that is needed for quick fixes?

Admiral CARTER. Yes, sir. That is true. We don't have any system to offer that will make any meaningful quick fix.

Now, we could do something in the perception area perhaps, but I have already cautioned you against the difference between what really buys you military effectiveness and what you get in the way of perceptions.

Senator WARNER. What about the SLCM?

SLCM THEATER WEAPONS SYSTEM

Admiral CARTER. I just was going to talk about that. The SLCM is being procured by the Navy as a theater weapons system. It does provide some utility in the strategic role in that it complicates the Soviet

calculus as to how many forces it has facing it that have the capability to strike the Soviet Union.

However, SLCM in a strategic role would have to be committed to the single integrated operational plan. This would require those ships or submarines on which SLCM were deployed to be dedicated to the SIOP which would seriously degrade the flexibility of these forces in their general purpose role. A SLCM on a submarine will have some reserve force capability that will be useful.

You will recall in your days as Secretary the terrible problems we had when our aircraft carriers were committed to the SIOP role. We had to keep a certain number of aircraft in range of their targets at all times. We suffered many years before we were able to break that umbilical. We just cannot allow ourselves to get in a position again where our general purpose forces, which we already have too few of, are tied down due to commitment to the SIOP.

So although SLCM definitely would have some strategic utility, I think it would be very difficult to present it in such a way that it would really affect the military effectiveness balance when you start to do your calculations as far as nuclear exchanges in the early part of a war. We are pursuing SLCM very much in the theater sense, for a theater role, but we are not trying to justify it as a strategic weapon.

Finally, the Navy has a great deal to offer for our strategic forces in the long run. I think this lies particularly in improving and modernizing our SLBM force. I would just offer a word of caution that we do not concentrate on very expensive, cosmetic, near-term fixes without thinking through whether they really have military effectiveness.

The sheer destructive capability of nuclear weapons vastly lowers their utility as an instrument of national policy. And although static measures are important from a perceptions aspect, slight changes in the near term static balance may not be as important as some people would believe.

I would urge that we concentrate our national resources on providing a longer term truly meaningful capability for the future of the United States.

That concludes my remarks.

[The prepared statement of Admiral Carter follows:]

PREPARED STATEMENT OF REAR ADM. POWELL F. CARTER, JR., U.S. NAVY,
DIRECTOR, STRATEGIC AND THEATER NUCLEAR WARFARE DIVISION, OFFICE OF
THE CHIEF OF NAVAL OPERATIONS

Mr. Chairman, gentlemen. I am Rear Adm. Powell Carter, the Director of the Strategic and Theater Nuclear Warfare Division in the Office of the Chief of Naval Operations. This Division was created by Adm. Hayward in January 1980 to provide a focal point within the Navy to translate national nuclear policy into Navy requirements to support national policy, and to assess how well our current and potential future systems, plans, and policies support these national objectives. I appreciate the opportunity to appear before this important new subcommittee, and look forward to its close relationship with the Navy.

I will lead off in the discussion today with a brief review of what national policy requires in the way of strategic nuclear systems, give you our assessment of where our strengths and weaknesses lie, and discuss several initiatives that are under active consideration to strengthen Navy strategic forces.

I will be followed by Rear Adm. Frank Kelso, the Director of the Strategic Submarine Division, who will address the status of the Trident program—both submarine and missile—and the on-going advanced development work.

The primary source document for national strategic nuclear policy is Presidential Directive 59 dated 25 July 1980. This document codified the evolutionary movement away from a primary countervalue, assured destruction policy toward one of greater flexibility for the National Command Authority, combining countervalue and counterforce capability into a countervailing strategy. The fundamental objective of the countervailing strategy outlined in Presidential Directive 59 remains deterrence, but it is deterrence achieved through a flexible and enduring force capable of responding appropriately to every level of violence. We must insure that any potential adversary understands fully that no plausible outcome of a nuclear exchange would represent victory by any reasonable definition of that term. If deterrence fails we want to preserve the possibility of bargaining effectively to terminate the war on acceptable terms that are as favorable as practicable with minimum damage to the United States and her allies.

To that end PD-59 requires that we be capable of fighting successfully so that an enemy would not achieve his war aims, and would consistently lose more than he would gain from initiating a nuclear attack. It is felt that the ability to deny an enemy his objectives, underpinned by a survivable and enduring capability to execute the ultimate response of punishment by large scale destruction of his urban and economic structure, constitute a more creditable deterrent strategy than an assured destruction strategy alone.

To meet the requirements of a countervailing strategy, improvements need to be made to our forces, their supporting command, control, communications, and intelligence, and to our employment plans in order to achieve a high degree of flexibility, enduring survivability, and superior performance in the face of enemy action.

The Current Navy strategic nuclear force was designed during the 1950's when massive assured destruction of the enemy's industrial and economic base in response to a nuclear attack on the United States or our allies was the national policy. The Navy's existing SSBN force is fully capable of carrying out such a policy today, but the force conceived in the 1950's and built in the 1960's is aging and requires modernization. Concurrently, the national strategic nuclear policy has matured and been modernized to deal with a far more complex world. At issue then is what should be the characteristics of the modernized Navy strategic force? To what extent should it be capable of carrying out the requirements of a countervailing strategy?

In evaluating how well Navy forces perform in meeting the national objectives it is useful to establish a yardstick of essential attributes or inherent characteristics that all strategic forces should possess. This approach is useful in that it encourages decision makers to focus on all the things strategic forces must accomplish, rather than on a single characteristic such as hard target kill capability, or on the impact on public perceptions of any initiative or program. It is in this context that I wish to evaluate how well Navy strategic forces score today and the relative utility of initiatives that are now under consideration.

These essential attributes can be characterized under four broad categories: (1) military effectiveness, (2) essential equivalence or what some label perceptions, (3) stability contributions and, (4) other factors such as costs, risks, availability, environmental, and so forth.

The several modernization initiatives that are relevant today include the backfit of Trident I C-4 missiles into additional Poseidon submarines (12 Poseidons are now scheduled to be fitted with the C-4 missiles and operational by the end of fiscal 1982), retention of the Polaris submarines as SSBNs, improvements in C-3, and the choice of the missile to be developed as the follow-on to the Trident C-4 missile. Admiral Kelso will cover the latter initiative in greater detail, but for the purpose of this discussion there are three basic missile modernization options:

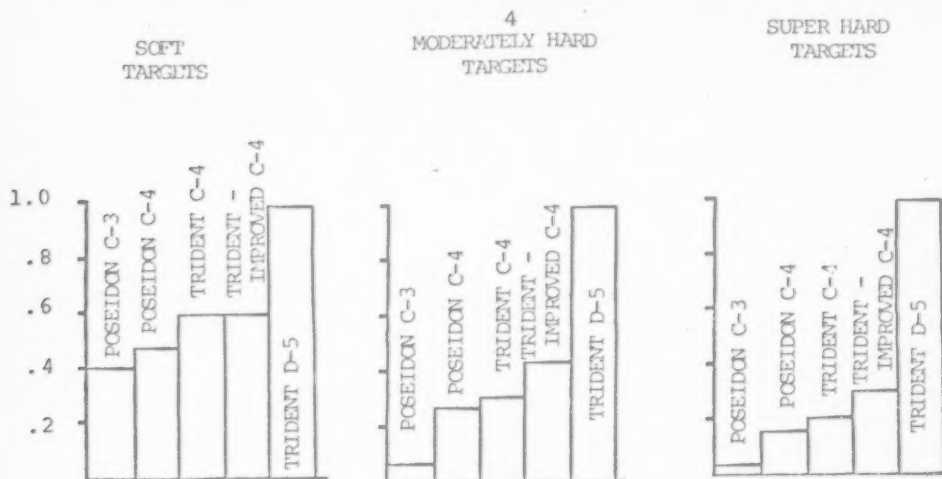
Upgrade the current C-4 by improving the accuracy.

Upgrade the current C-4 by improving the accuracy and increasing the full payload range.

Design a new missile that will utilize the entire volume of the Trident submarine launch tube. This would result in about a [deleted] increase in payload over that attainable with the C-4 missile and a significant increase in missile accuracy.

MILITARY EFFECTIVENESS

The most obvious element of military effectiveness is how well the system performs against its targets. In general, targets can be broken down into three broad groups: (1) soft targets which are dominated by the industrial and economic base plus a large number of military targets such as airfields, (2) a modest number of moderately hard targets and (3) the super hardened targets such as missile silos and launch control centers. The relative performance of existing Navy missiles and future alternatives against this target base are shown below on a scale where the most effective missile is assigned a value of 1.0.



Several important observations can be made with the figures:

Against the soft targets the Poseidon which has been backfitted with C-4 missiles shows modest improvements over the C-3 missile currently deployed in most of the Poseidon force. There is essentially no difference between the C-4 on Trident and the improved C-4 because the improvements in accuracy obtained with the improved C-4 has an insignificant impact on weapon effectiveness against these soft targets. The large improvement given by the D-5 is due to the [deleted] greater payload of the D-5 compared with the C-4 variants.

Against the moderately hard targets both the C-4 and the improved C-4 are significantly more effective than the existing Poseidon C-3 missile; due primarily to the better accuracy of these missiles. The D-5 is more than twice as effective as the best C-4 because of both its better accuracy and its higher payload.

Against the super hard targets the advantages of the larger, more accurate D-5 are even more apparent.

The C-4 and the C-4 backfit into Poseidon submarines will have two major payoffs with regard to military effectiveness—a substantial capability in targeting effectiveness against the moderately hard targets, and greatly increased operational area and targeting flexibility due to its longer range. Additional C-4 backfits would result in little increase in targeting effectiveness over that which will be realized with the current program since it provides enough C-4s to adequately cover the moderately hard targets.

The SLBM force today is the most survivable and endurable element of our strategic forces and a broad range of analyses—for example by the CIA, the Navy and Rand studies done for the Air Force—are unanimous in their view that the SLBM force is essentially invulnerable today and it will remain so for the foreseeable future. This is largely a result of the Navy's aggressive program in threat assessment, submarine improvements to make them less detectable against advanced threats, and missile improvements—primarily longer ranges—to provide more ocean area a potential enemy must search out to threaten the force. The C-4 backfit program was designed for the latter reason—to provide a portion of the force a longer range missile so as to relieve SSBN concentra-

tion in the more forward areas. In our view the projected threat, especially when viewed in the light of the \$200 million backfit cost per SSBN, does not warrant additional backfits at this time. If we see such a threat developing, and it won't develop over night, there should be adequate lead time to backfit additional Poseidon with C-4 missiles.

Command, control and communications (C³) is another critical aspect of military effectiveness. The force must be responsive to the needs of the national command authorities and at the same time the communications systems must not degrade the high survivability enjoyed by the SLBM force. Responsiveness is often equated with speed or rapidity of communication. When dealing with a survivable force which need not launch rapidly to ensure its own survival, assurance of communication is the most important factor. This is particularly true in the case of strategic forces where the vast majority of the target base is relatively fixed and therefore, not time urgent. TACAMO, a C-130 aircraft with a high powered jam resistant very low frequency radio transmitter, is the Navy's survivable relay link for emergency action messages and provides us assurance that the message will get through to the submarine, provided that TACAMO receives the message from the National Command Authorities. We do not have an adequate number of TACAMO today and those that we do have are old with no growth potential remaining.

When considering communications and its impact on force survivability, day-to-day normal peacetime operations are the most critical. Antisubmarine warfare is a war of attrition. Given a capability it takes time, weeks or months, to detect and localize any significant portion of a submarine force. Thus it is critical that our SSBNs remain undetected in their daily operations. If not, an enemy could use the preattack period to detect and localize the force, and at a time of his choosing could then launch an effective attack over a short period of time.

In order to maintain the degree of responsiveness required, our alert submarines are required to remain in continuous communication with the shore command. This requires having an antenna on or near the surface of the water which might be detectable in the future. The extremely low frequency (ELF) system, because its signal penetrates sea water to great depth, will permit the SSBN to break the antenna umbilical to the surface and provide this additional insurance for continued covertness during peacetime. ELF is not a substitute for an existing system; rather it complements existing very low frequency (VLF) transmitters ashore, TACAMO, and satellite systems.

C³ is the weakest link in our strategic system and the CNO has assigned top priority to improving Navy strategic C³. I do want to emphasize however that C³ is a national problem, not unique to the Navy's systems.

As pointed out earlier flexibility is an essential ingredient of the countervailing strategy and has a major impact on military effectiveness. With improvements to our missiles in range, yield, and accuracy we can provide a countervailing capability across the entire target spectrum. We now have an ability to do onboard retargeting, ranging from a rather rapid shift to another preplanned target set to a more lengthy procedure where the submarine is given only the coordinates of the new AIM points. Inherent in a mobile force is the ability to respond to increased threats in a manner which is nonescalatory and does not tend to encourage the Soviets to further proliferate strategic arms. Also, mobile systems can present a multiazimuthal threat to complicate defenses or avoid overflight problems, and can trade range, payload, accuracy and time-of-flight to meet special targeting requirements.

PERCEPTIONS AND EQUIVALENCE

This attribute is frequently thought of in terms of comparing United States and Soviet inventories of weapons, delivery vehicles, throwweight, equivalent megatons, etc. They are easy to grasp, readily understandable and thus form the basis of world opinion on the perceptions of the nuclear power balance. Perceptions are important, but we should guard against allowing this attribute to dominate our force modernization calculus. For example, retention of Polaris submarines beyond the planned dates of their withdrawal from the strategic mission is primarily a perceptions issue. When viewed as a draw down in number of strategic submarines or launch tubes, the loss is impressive. When other measures are considered—numbers of RV's, equivalent megatons and, most

importantly, military effectiveness, Navy strategic force capability will increase over the next 5 years and beyond, even considering the slippages currently being experienced in delivery of the first Trident submarine. Retention of Polaris would add less than 5 percent to the Navy's total strategic capability, and only 1 or 2 percent to the national capability. This must be balanced against the cost of retention and the adverse impact on personnel and training.

STABILITY

The contribution of each element of our strategic force structure to long term stability, crisis stability and arms control stability is important though often slighted in assessing strategic systems. Long term stability can be provided by insuring that the strategic balance cannot be upset by an unanticipated weakness or failure in our own systems or by some sudden technological breakthrough by the Soviets. The redundancy in our mix of strategic forces provides a hedge against such a sudden change in the balance, providing too much of an important force characteristic such as time urgent, hard target kill capability is not concentrated in one system.

Crisis stability and deterrence go hand in hand and our forces should be structured such that they can both limit the potential military payoff from a Soviet first strike and also threaten unacceptable damage from a U.S. retaliatory counterattack. Survivable and enduring forces are key to achieving these objectives.

Arms control stability can best be promoted by deploying systems that do not provide incentives for the Soviets to further proliferate their strategic arsenal.

My thinking and analysis has convinced me that mobile, nontargetable systems are essential to a stable environment. Their survivability and effectiveness is essentially decoupled from proliferation of Soviet offensive strategic systems and we do not have to build systems in excess of military needs in order to compensate for system vulnerabilities. Furthermore, if sea based, they remove the focus of a counterforce exchange from the territory we wish to defend.

OTHER FACTORS

Sea based systems in general and Trident in particular are costly systems; however, when one considers the cost per surviving unit of destructive potential or capability Trident compares most favorably with other basing modes. Among the missile upgrade options being considered by the Navy the large volume D-5 missile wins the cost-effective argument by a wide margin simply because the larger payload and improved accuracy will permit the same job to be done with fewer submarines. The problem has been that the large near term R. & D. outlays required to develop the D-5, when balanced against the pressing needs of Navy general purpose forces and availability of funds has precluded aggressive pursuit of the D-5 development.

As Admiral Kelso will discuss with you the C-4 development program has enjoyed considerable success—all design goals have been met and several important performance parameters are significantly better than the initial goals. We have a proven management, R. & D. and production team which has been operating without interruption for about two decades. This provides confidence of meeting the performance goals of an improved follow-on missile.

He will address availability dates also. An important consideration is that the capability provided by an improved new missile will be realized at IOC and will steadily improve as missiles are added to the force. It is not necessary to wait until the system deployment is almost complete in order to have a surviving capability.

From the damage limiting aspect, SLBMs do not present a large number of targets in the United States for the Soviets to attack.

Two bases will be involved—Bangor, Wash., and Kings Bay, Ga. No environmental problems are anticipated.

SUMMARY

The Navy cannot offer a near term solution that will redress the overall strategic balance problems that some feel will exist in the middle 1980's. The backfit of additional C-4 missiles in Poseidon submarines, which is advocated frequently as a quick fix, will add little to our military capabilities but would cost about

\$4 billion if the remaining 19 Poseidon submarines were modified. Retention of Polaris, though cheap compared to the additional backfit proposal, will add so little to our retaliatory capability that it is not worth the cost in dollars and especially manpower.

For the longer term, SLBM's when evaluated against the four criteria: military effectiveness, essential equivalence or perception, stability contributions and other factors score high.

In my view, caution should be exercised in funding expensive, short term, largely cosmetic fixes to redress perceived lack of strategic nuclear equivalence if doing so will detract from adding a real and long lasting capability to our overall nuclear posture. The levels of destruction inherent in nuclear weapons provides for a greater band of uncertainty in the calculation of force sufficiency, and severely limits the usefulness of nuclear forces as instruments of policy in comparison to general purposes forces. Near term, meaningful steps to provide for a modern, highly capable nuclear force to support the national strategy into the future deserves your top priority. Navy's strategic initiatives are structured to offer modernization alternatives that would add significantly to military effectiveness and result in a strategic posture that is more stable than that existing today and at a competitive cost.

WARHEADS AT SEA STUDY

Senator WARNER. I am reminded, Dr. Zeiberg, that last year we talked about a warheads-at-sea study. What is the status of that?

Dr. ZEIBERG. The Navy has completed a draft of that, it is my understanding, and is soon to submit it to the Secretary for his approval to send on to you. Perhaps Admiral Carter, who is leading that study, would comment further.

Admiral CARTER. Yes, sir. We have completed that study. I just read the draft report yesterday and it needs some changes to it. It should be to Dr. Zeiberg shortly.

The remarks that I have made as far as the Navy's capabilities in the near term are consistent with what that study has found out.

Senator WARNER. I am immensely interested in this program and I appreciate the candor with which you have spoken this morning.

Senator LEVIN, we are ready when you are ready, but we will proceed until you have indicated to me. You want a little more time?

Senator LEVIN. Thank you, Mr. Chairman, that would be helpful.

Senator WARNER. All right, Dr. Zeiberg, we will proceed then to the next witness. One further question.

On the TACAMO, did you indicate that you felt that system was aging? Is the TACAMO aging?

Admiral CARTER. I mentioned that.

Senator WARNER. Who wants to take up TACAMO and brief me on the status of that program? When was it introduced into the fleet?

Captain DONOVAN. The TACAMO concept came out of the Defense Science Board with the advent of Polaris in 1958 or 1959 as a survivable system.

Senator WARNER. When did they actually get the aircraft?

Captain DONOVAN. The aircraft went up in the early sixties and then were continuously airborne in the Atlantic area in September 1973. We have flown that type of an aircraft for almost 19 years, sir.

Through the years we have changed and modernized its communications capability and the equipment on the aircraft. Each time we have added weight and added receivers and added power. The aircraft right now is exceeding its airframe capability by about 10,000 pounds in flight which limits its endurance.

Senator WARNER. What is the solution to that problem?

Captain DONOVAN. Well, we have programed replacement airframes, new airframes to bring the force up to a level to allow us to have aircraft [deleted] in both oceans. But we really believe we should incorporate the communications capability into a new airframe, an airframe that would have the endurance to match Trident and Trident's missile systems and possibly greater airborne endurance from refueling. So that instead of one flight at a time, we would have the capability to stay up for as long as several days.

We are examining that proposal and it is part of our fiscal year 1983 budgetary considerations.

Senator WARNER. The question is are we in an EMP hardening program?

EMP THREAT TO AIRBORNE COMMAND POST NETWORK

Captain DONOVAN. Yes, sir. We recognize that one of the most significant threats to our airborne command post network is an EMP attack. We have a good EMP program and the TACAMO system has been tested on that aircraft on the EMP testbed. A layered EMP approach has been developed where you begin by protecting the outer skin of the aircraft and working in to the electronic components to raise its resistance.

Of course, one of the disadvantages of EMP protection is in most instances it adds weight to an already overweight aircraft.

Senator WARNER. What is the existing TACAMO fleet?

Captain DONOVAN. There are 13 aircraft at this time and it is programed to attain 18 in fiscal year 1983, sir.

Senator WARNER. So you are still in a building program?

Captain DONOVAN. We are building from a one-ocean capability, essentially the Atlantic area where we have one aircraft continuously airborne to [deleted] capability in the Pacific tied to the advent of Trident to support both oceans.

Senator WARNER. Then you are at a decision point as to whether or not to go forward with this existing aircraft or have a replacement aircraft, is that it?

Captain DONOVAN. Yes, sir. That decision is being addressed in our 1983 considerations. We addressed it in 1982 and it didn't make the budgetary considerations in 1982 but we still have time to make that decision next year, sir.

Senator WARNER. What additional funds are needed to allow for the orderly TACAMO replacement program?

Captain DONOVAN. The next cost would be approximately—and I will have to provide that specifically for the record—about \$1.3 billion additional money, sir.

[The information follows:]

TACAMO REPLACEMENT COSTS

The cost to develop and initiate procurement during the Five Year Defense Plan beginning in fiscal year 1982 is \$1,280 million. The following years procurement would total [deleted] to complete acquisition of the required force of [deleted] EMP-hardened, fan-jet ECX. This investment would be offset, in part, by cost avoidance actions with the EC-130 force as ECX comes into the fleet.

Senator WARNER. In looking at the follow-on TACAMO aircraft do we still want to go to a propeller-driven plane?

Captain DONOVAN. Yes, sir. We have examined about 14 to 16 various types of aircraft. One of the key factors is the need to have a long trailing wire vertical VLF antenna [deleted]. A version of the Boeing 707 that was used for the AWACS can fly that profile as well as a Lockheed version that has been looked at. We would use a new CFF-56 engine which is a more efficient engine.

Senator WARNER. Your first response was no but now it is yes?

Captain DONOVAN. Oh, no, sir. We would probably use a jet engine, sir.

Senator WARNER. So the next version would be a jet-type aircraft?

Captain DONOVAN. Yes.

Senator WARNER. And you get an air speed and a flying profile such that you can get [deleted].

Captain DONOVAN. Yes, sir. We would almost double the air speed of the aircraft which would improve its range and also improve its survivability should it come under attack to evade.

Senator WARNER. Thank you very much.

We will now entertain questions from Senator Levin who has spent a great deal of time studying the ELF system. We welcome you.

Senator LEVIN. I thank the Chair for the way he phrased that. I also want to thank the Chair for his courtesy in allowing me to intervene here this morning with a few questions although I am not a member of the subcommittee.

Senator WARNER. Senator, you are a member of the full committee and as such you are ad hoc on this committee.

Senator LEVIN. I thank the Chair.

First to Admiral Carter.

In your prepared statement, Admiral, you say that "Antisubmarine warfare is a war of attrition. Given a capability it takes time, weeks or months, to detect and localize any significant portion of a submarine force."

The question is this. Would you agree that despite the expenditure of billions of dollars or rubles that the Russians have made in past decades to improve their ASW capabilities, they have failed to develop such a detection and localization capability required to successfully attack and destroy our strategic missile submarines?

Admiral CARTER. Yes, sir; I would agree that is true.

BACKFITTING THE POSEIDON SUBMARINE

Senator LEVIN. Also in your prepared statement Admiral, you state the backfit of more Trident I missiles into more than the 12 already-planned Poseidon submarines, as a hedge against any improvement in the Soviet ASW threat to these submarines by giving them a larger patrol area in which to hide, is not necessary at the present time because all of our Poseidon missile submarines are invulnerable at present and you do not expect them to be threatened to any greater degree in the future to warrant all of them having a larger patrol area. Is that an accurate statement of your position?

Admiral CARTER. Yes, sir. I should caveat that a little bit in the fact that the ability to backfit the submarines, we already know how to do it, packages have been developed and it can be done in a relatively short period of time. So if the Soviets progress more rapidly than we expect in their ASW capability we have the ability to backfit those additional submarines rather quickly versus a situation where we have to go in and develop a whole new approach to solve that.

Senator LEVIN. But how long would it take to backfit if the need arose?

Admiral CARTER. I would defer to Admiral Kelso.

Admiral KELSO. We could probably do [deleted] sir, under normal situations. If you wanted to do all of them [deleted] unless you went into a real crash program. We can do the backfit alongside the pier or you can do it in a shipyard. We are doing it both ways. If you had the equipment which you have got to buy, which really is the leadtime we are talking about, [deleted] including doing it alongside a pier plus the ship doing a shot and testing the crew out after the missile was on-board. But the real thing that slows you down is the ability to buy the equipment. So, buying the equipment would slow you down.

Senator LEVIN. So is it fair to say then, Admiral, that you are confident enough about the absence of Soviet ASW capability that you feel that a [deleted] leadtime is safe in terms of that backfitting?

SUBMARINE DETECTION

Admiral CARTER. Yes, sir, I am as far as a major breakthrough.

Senator LEVIN. Admiral Griffiths last year testified that it is extremely difficult for even the U.S. Navy, which has a far better capability that I think everybody acknowledges in ASW than does the Soviet Union to detect our strategic missile submarines even when they deploy existing communications such as the towed buoy antenna and the floating wire antenna.

Admiral Griffiths stated that even with the floating wire antenna the success rate of U.S. ASW forces is extremely small.

He went on to say, and this is another quote, [deleted]. "This compares with over 6,000 SSBN patrol days that U.S. SSBN's conducted per year."

I am wondering, Admiral Carter, and Admiral Kelso, whether you would agree that these statements remain true today despite the passage of another year?

Admiral CARTER. Yes; I would agree with that.

Admiral KELSO. Yes, sir; I would agree with that.

Senator LEVIN. Admiral Carter, there have been allegations that that Soviet attempts to use [deleted].

To place this alleged threat in its proper perspective would you agree with the following conclusion?

"It is believed that even if the Soviets achieved some success in this area it will not significantly increase threats to Western submarines since [deleted]."

Admiral CARTER. Yes, sir; I would agree with that.

Senator LEVIN. Admiral, what hypothetical technologies do you expect for the future that would give the Soviets the capability to

[deleted]. There was some reference to these earlier in your testimony before I was here and I would like to have you expand on that, if you would. What are those hypothetical technologies, those paper technologies that might some day work out?

Admiral CARTER. I can't answer that. Maybe Dr. Zeiberg can.

Dr. ZEIBERG. The issue is most germane if you could do it using airborne assets, airplanes and satellites. First, there is no conceivable way that I know of to do anything by satellite. Probably that will remain true, as far as I can see it, into the future for many decades.

[Deleted.]

We have had that comparable dedication in the last 2 years. We haven't found anything that gets us excited yet as far as pursuing it operationally or feeling comfortable with any new capability. But the potential threat is there and the physics suggest it is possible.

If you can do something with an airplane, if you can pick up a capability to sweep 3 or 4 or maybe 5 thousand square miles an hour by having an airplane fly and look out two sides at the ocean in relatively large areas, that starts to become a serious threat. If the Soviets had a threat of that magnitude we would be very worried.

Senator LEVIN. Do we have any evidence that they do?

Dr. ZEIBERG. [Deleted.]

What is very important is their motivation. If they think they have found something to pursue then they will continue to make investments. Consequently, we need a hedge. We need to worry about what we would do [deleted].

Going deeper brings you into problems we are alluding to here which is the deeper you go the more difficult your communication becomes unless you go to lower frequencies and therefore ELF.

Senator LEVIN. Are we pursuing that same technology?

Dr. ZEIBERG. We are pursuing a considerable amount of theoretical and experimental work to find out what is in that possibility.

Senator LEVIN. When will we know whether or not it is even possible?

Dr. ZEIBERG. Well, it is all a function of the quality of the sensors and what the target is doing [deleted].

Senator LEVIN. Can you give us an idea as to when we will have any idea as to whether or not this theoretical possibility is going to be real?

Dr. ZEIBERG. No; I really can't make a prediction on that. I can tell you what you would need to do for a surface ship but I can't tell you what you would need to do for an operational capability against a submarine because we don't understand enough about it. We are still learning.

Senator LEVIN. How much money are we putting into discovering whether that theoretical technology would ever be useful?

Dr. ZEIBERG. A fair amount.

Senator LEVIN. Well, would you characterize it as a major project of ours?

SSBN SECURITY TECHNOLOGY PROGRAM

Admiral KELSO. Well, we have a technology program within the SSBN security technology program. It runs normally, the total program, of around \$40 to \$42 million a year where we try to look at all

theoretical concepts that we expect could be a threat to our SSBN's. We are running an experiment [deleted].

So I would say that we should be able to analyze the results of that experiment [deleted]. I would think to be able to say what we think the threat assessment [deleted] which we have which we are using for the test.

Senator LEVIN. Are we pursuing this in terms of our own ASW, too, against their SSBN's?

Admiral KELSO. If we can [deleted] then we would turn that technology over to the people in the Office of the Chief of Naval Operations who are ASW oriented and then they would develop a technology for us to use. That is the follow-on product if we find anything in our efforts.

Dr. ZEIBERG. I would like to clarify one point. When I said [deleted].

The experiment that Admiral Kelso referred to is a several million dollar effort this year alone. It started last year and will continue into next year. My guess is that it is over a [deleted] project.

Senator LEVIN. So we can get a timetable pinned down, you say that the [deleted] and we will have some results [deleted].

Admiral KELSO. This particular test, Senator, [deleted].

Senator LEVIN. But don't most commanders [deleted] most of the time?

Admiral KELSO. Well, no, sir, I would say that is not true.

[Deleted.] What we are worried about sir, is the future, because it is a technology of observables.

Senator LEVIN. I understand very clearly what the potential problem is. I just want to see how potential it is from year to year, and every year we examine this, it seems to be as potential as it was the year before, and no closer to being a reality.

In terms of what the commanders do, I wish you would check that out more currently.

Admiral KELSO. I would say there are more people using the [deleted] today than used it 5 years ago. I would agree with that. However, if you, as a redundancy, require that you be able to [deleted] carry out your mission.

Senator LEVIN. If [deleted] lost?

Admiral KELSO. Yes, sir.

Senator LEVIN. How often does that happen?

Admiral KELSO. I don't know offhand.

Admiral CARTER. I can give you a feel for that. Just before I came here to Washington, I commanded the squadron of submarines in Rota, Spain, which has since been transferred to Kings Bay. I had 10 SSBN's in that squadron. I would say only on about one out of every five patrols did I get a boat back who had been able [deleted] for more than half of the patrol. We have been working hard to improve it [deleted].

Senator LEVIN. If I could ask just a few more questions.

Senator WARNER. Yes, Senator Levin.

Are we still working [deleted] if I can get the right wording—

Dr. ZEIBERG. That doesn't break.

[Laughter.]

Senator LEVIN. No, not that doesn't break, but one which we can renew. [Deleted.]

Admiral KELSO. Replenish. [Deleted.] So it has a redundancy built in for the future submarine. I am not familiar with a project where we have a capability [deleted].

Senator LEVIN. Thank you. Just two more questions, if I could, Mr. Chairman.

One, and I would like to ask this of Admiral Carter. I believe it was in response to one of the chairman's questions at an earlier hearing this year that the CNO made the following statement and I would like to know whether or not you would concur.

He said that: "I would note that the most serious deficiency in the Navy's strategic nuclear posture, in my judgment, is the lack of reliable, survivable communications with SSBN's at sea."

Admiral CARTER. Yes, sir; I would agree.

Senator LEVIN. And is the proposed ELF system a survivable system?

ELF SYSTEM NOT A CURE-ALL

Admiral CARTER. No, sir; it is not.

Senator LEVIN. Then you agree that the ELF system would not cure the Navy's most serious or most important deficiency in their strategic nuclear posture, the survivability of the system?

Admiral CARTER. It will not by itself cure it; no. It was a point I made earlier with Senator Warner.

Senator WARNER. Let me rephrase for the record how I put it just shortly before you came in, Senator Levin.

We had a very helpful exchange here on the utility of the ELF system in terms of its ability to enhance the survivability of our SSBN force.

Even though we acknowledge the system is not survivable in a first strike scenario, it helps greatly to enhance our retaliatory capability as a deterrent immediately following that first strike. In addition, how that system, were it in place today, would vastly complicate the Soviet analysis of our submarines in that they wouldn't be able to collect the data base on which they do their research and development in these areas.

Admiral CARTER. Yes, sir. If I could paint a little scenario for you: As you would lead up to a crisis and you would work your way through the crisis phase to an initial Soviet strike. The Soviets would try to locate our submarines before hostilities start, as many of them as they possibly could, with the idea of destroying them in the initial strike if possible.

They also would probably try to jam our communications to our submarines and interfere as much as they could with our command and control short of war.

The ELF system contributes significantly there in two ways.

One, the ELF system is very difficult to jam. It is almost totally jam resistant.

Two, our submarines with ELF operational, can operate at depth and speed offering a very good hedge against any Soviet possibility of locating them [deleted].

The ELF system transmits at all times. The TACAMO does not [deleted].

Those submarines that are at depth in transit come up to copy a broadcast if there is no ELF [deleted].

If ELF is attacked and that signal is lost, the submarine will immediately know that it has to come to communicate with TACAMO aircraft. If ELF did not exist, those submarines at depth in transit would not know anything has occurred or that the National Command [deleted].

Senator LEVIN. Is that the bell-ringer function?

Admiral CARTER. Well, some people refer to it as a bell-ringer, but I think there is a distinction. A bell-ringer system would be one that is only capable of telling the submarines to come to a shallow depth to copy a message by other means. The ELF system is designed to have a capability to transmit coded operational messages to the submarine and it would be so used in the normal day-to-day or pre-attack period. If, however, ELF were destroyed in a surprise attack, the loss of the ELF signal by the submarine would in effect tell the submarine to come to a shallower depth and copy other broadcasts; for example, the survivable TACAMO.

Senator LEVIN. Well, it is the same thing. It is just the negative of it, isn't it? When the bell stops ringing, you come to the surface.

Admiral CARTER. I think you could say that. However, I think in some peoples' minds, a bell-ringer has a simplistic connotation in that it indicates that is the only function it performs.

Senator LEVIN. No. That is why I was careful to say that particular function is really just a bell-ringer function and when the bell stops ringing, you come to the surface.

Admiral CARTER. Yes, sir, but it does provide I think a significant contribution in assuring the continued invulnerability of our SSBN's and, when used in consonance with TACAMO, mitigating our C³ problems.

Senator LEVIN. Do you presently have continuous communications on VLF?

Admiral CARTER. Yes, sir, with those submarines [deleted]. With those submarines [deleted], we are not in continuous communication with those. Those come up to copy [deleted].

Senator LEVIN. So it would take [deleted]) those submarines [deleted].

Admiral CARTER. Depending on when you could get the message through to them. [Deleted.] If the submarine was about to come up to copy [deleted].

Senator WARNER. That is the key point that concerns me. Comment, Dr. Zeiberg and Admiral Carter, on the data base aspect of this, that is, on the assumption the Soviets are proceeding with their ASW R. & D. They are gathering some facts presumably about our operational pattern and how an ELF system were it in place now would complicate their ASW R. & D. problem. Am I correct in that?

Dr. ZEIBERG. Yes. I expect once they had confidence in their technical approach they would look for opportunities to test it out against us in some manner. They might be able to hide that in some of their normal air operations, [deleted]. So they could provide a data base.

As you might expect we would try to do the same to them and we would get a good idea.

Senator LEVIN. As I understand it, they can't gather those facts now.

Dr. ZEIBERG. [Deleted].

Senator WARNER. [Deleted.]

Dr. ZEIBERG. Yes.

Senator WARNER. Is there a personnel factor in this equation, namely, that the men that volunteer for submarine service would have a greater degree of confidence in their individual survivability if we had this system in place?

Admiral CARTER. Well, I think ~~that~~ is definitely true. I think one reason they feel confident and proud of the force is that over the years, through the submarine security program, we have taken actions ahead of time to identify potential threats, laid the groundwork and provided the systems so that we managed to stay ahead of the Soviets at all times. I think this system of ELF is an extension of this same history of taking that kind of action.

STABILITY OF SSBN AND SLBM PROGRAMS

Dr. ZEIBERG. Earlier this morning I used the term "stability" in our SSBN and SLBM programs. I think the point Admiral Carter just raised is another way of stating it, that we have been smart enough to make the investments early enough to anticipate the problems and take action that would eliminate the possibility of problems arising. For that reason we have no reason to worry about the survivability of our sea-based forces today.

We are talking about an investment today that will let us have that same confidence 5 or 10 years from now.

Senator WARNER. Long before Senator Levin and I joined the Senate this program was recommended by the Department of the Navy. I guess it was 1968 or 1969. What was the first year?

Senator LEVIN. I don't believe I can remember.

Senator WARNER. Do you remember, Dan?

Captain DONOVAN. The initial research came in 1958 to 1959, sir, and we went through several evolutions. The closest we ever got was to a larger system called Seafarer which was in that time frame you mentioned, sir.

Senator WARNER. We would have it in place now had it not been for the political considerations of this matter.

Captain DONOVAN. In all honesty, Senator, that certainly is one factor, but there were also some honest technical and environmental issues that had to be resolved to insure that the system was safe. We needed to do our own homework in this regard. We went down that path and we think we have done that, sir.

Senator WARNER. In 1981, yes. But didn't we also have those same assurances much earlier?

Captain DONOVAN. Our research is much more extensive, particularly in the environmental and the technical aspects today than it ever was 10 years ago. We went into what we called the concept validation phase of an ELF system in 1972, 9 years ago, with good research with-

out a very extensive environmental impact survey which we have done since that time and without extensive sea testing of experimental receivers on our submarines.

So I would say our confidence is an order of magnitude better today than it was in 1972, sir. We could have had this system operational 6 to 7 years ago, sir.

Senator WARNER. That is the point I am making. We denied our submarine crews this added element of safety for those many years and I think it is a burden on us now to resolve this problem. We will do it in the free spirit of this body, we will not, Senator Levin, one way or another?

Senator LEVIN. I hope not, Mr. Chairman—

[Laughter.]

Senator LEVIN [continuing]. Until the need is clear and until the alternative which may be available is proven not to be available. If we can take the risk on not backfitting submarines with missiles because we are confident they don't have the capability to detect our submarines, for the life of me I don't know why we don't do now what we did in 1975.

Have we lost anything, by the way, by not having an ELF system since 1971, Admiral?

Admiral CARTER. I think it is very difficult not being a Soviet to know what we have lost, Senator.

Senator LEVIN. Do you have any reason or do you have an opinion as to what we have lost here?

Admiral CARTER. My personal opinion is that we have lost a great deal of operational flexibility. We have crews today that could have received a great deal more training and more capability through the added flexibility we would have realized by not being tied to slow speeds at relatively shallow depth. This applies not only in our strategic forces but our attack forces as well.

Senator LEVIN. In terms of safety of our crews have we lost anything, in your opinion?

Admiral CARTER. Obviously not, since we haven't lost a submarine. Again, I can't say as far as Soviet capability what we have lost or whether we have contributed to the Soviet data base over these years. I can't really say.

Senator LEVIN. Just one other question, if I could, Mr. Chairman, then I will withdraw from the field for a moment.

Another justification, Admiral, that some people use to promote the ELF system is that it removes the speed and depth restrictions on the SSBN's which are now required, [deleted]. Is it not true that under current Navy plans they can implement improvements [deleted] which would permit a submarine to operate at the same speeds and depths at which it states it will operate the ELF system?

Admiral CARTER. I am not aware of any, but my position is plans and policy. Let me defer to the technical program people.

Admiral KELSO. Sir, I am not aware of one that we are planning to put on an SSBN. I know there is one in experimental development that is being looked at for SSBN's and I would like to answer that question for the record because I am not familiar with that program, if I could, sir.

[The information follows:]

TOWED BUOY ANTENNA

The Navy is testing a replacement for the buoy which is currently installed in SSBNs and which has historically had low reliability. This replacement buoy incorporates several features which are expected to improve buoy utility and reliability, but will not significantly improve its speed or depth capability.

The Navy is also attempting to develop a buoy for use in SSNs in direct support of battle groups. The development goals of this buoy, which employs a radically different handling system, approach the already demonstrated capabilities of the ELF system. [Deleted.]

It must be emphasized that, although improved communications buoys could allow the submarine to make better use of depth and speed capabilities to avoid detection, the nature of VLF signal penetration into seawater dictates [deleted].

Senator LEVIN. Thank you, Mr. Chairman.

If it is agreeable, I will have some additional questions for the record.

Again, I do want to thank the Chair.

Senator WARNER. We will leave the record open until 5 p.m. today.

Senator LEVIN. Thank you.

Senator WARNER. Thank you very much for your appearance and interest in this problem.

Now, we will proceed with Admiral Kelso.

**STATEMENT OF REAR ADM. FRANK B. KELSO II, U.S. NAVY,
DIRECTOR OF STRATEGIC SUBMARINE DIVISION, OFFICE OF
THE CHIEF OF NAVAL OPERATIONS**

Admiral KELSO. Mr. Chairman, I am Adm. Frank B. Kelso, the Director of Strategic Submarine Division in the Office of Chief of Naval Operations.

I have prepared a statement for the record, sir, and with your permission I would submit that and touch on several areas. Some of the areas on my statement have already been covered in this hearing and I would not propose to cover them again unless you have questions, sir.

Senator WARNER. Please proceed, Admiral.

Admiral KELSO. I would like to say that the strategic capability of the sea leg of the Triad when you measure it in the numbers of warheads and the target destruction capability is improving and it will continue to improve throughout this century.

We presently have three classes of SSBNs which are deployed. The 10 oldest SSBN's, the Polaris force, are being removed from active strategic service, as Admiral Carter has indicated. Two are being deactivated and dismantled in accordance with the SALT I agreements. The other eight are scheduled to be converted to serve as single crew attack submarines. Three have already been converted, two are in the process of conversion and the remaining three will be converted over the next year. The option to retain these three as single-crew SSBN's will be maintained through this fiscal year.

POLARIS PHASEOUT

As a result of the Polaris phaseout, the Guam-based squadron will be disestablished this year. The personnel which have been made avail-

able by the conversion of these ships to single-crew submarines are easing the critical shortages in technical ratings throughout our forces.

As we have mentioned, force modernization plans include both new submarines and new or improved missiles.

Our original 41 SSBN's were commissioned in an 8-year period from about 1959 to 1967 with a 20-year design life. We have decided to extend the service life of 31 of these ships to 30 years and we plan to operate them throughout this period. This means that their phaseout period will be in the midnineties from 1992 to about 1997.

The inability to backfit modern noise reduction equipments and systems into these submarines, and the lack of room for growth says that their future capabilities will be limited. As you are well aware, we decided to replace these ships some 10 years ago with a Trident submarine and we have discussed the fact that we have problems with the delivery, and I won't discuss that in my statement.

But the problem facing us is a building rate of Trident submarines which will make sure that we replace those submarines before they are all retired.

When we turn to missile modernization we have now progressed through five major sea-based ballistic missile developments. The Trident I missile has been deployed on five of our Poseidon SSBN's. By September of 1982 a total of 12 Poseidon submarines will be operational with that missile backfitted. We currently have five submarines in overhaul that will come out over about the next 12 to 14 months all backfitted. The five that have been completed were done alongside a pier in Cape Kennedy and there is one more to be done in that way.

Trident I provides these ships with increased survivability inherent in the resulting greater increased operating area provided by the missile's increased range. The backfit program also permits these submarines to cover potential targets immediately on departure from the operating base in Kings Bay, Ga. Thus we reduce our dependence on overseas bases. These submarines basically were the ones that came from Rota, Spain, and were reassigned to Kings Bay, Ga.

POSEIDON SSBN'S

The remaining 19 Poseidon SSBN's will continue to carry the very capable Poseidon C-3 missile which is the backbone of our force today.

The backfit program has provided flexibility in our strategic submarine program as well as the ability to deploy the Trident I missile in the fleet on schedule despite Trident submarine delays. However, these backfit boats as have been described this morning are not a substitute for the follow-on Trident submarine which gives us both the room to modernize and a greatly quieter ship as a hedge against future ASW possibilities.

TRIDENT I MISSILE EXCEEDS TESTS

The Trident I missile was deployed on schedule in October 1979 after the most successful test and evaluation program ever conducted in a submarine ballistic missile program. The performance objectives in terms of number and yield of re-entry vehicles and in range were exceeded.

While the data base is small, it appears that system reliability and accuracy objectives have been met if not bettered. Production unit cost was less than the design to cost estimate.

This missile was produced by a strategic systems project office acting for the Navy as the prime contractor and was produced under an evolutionary concept in all of the family of missiles which I have talked to you about both within the Navy and with contractor support.

I think that is an important point to make because the team has been together for some 20 years and they have been very successful in producing what they have advertised that they could produce. Sometimes I think in discussions of Trident, it is overlooked, that the missile programs have been extremely successful and the ship has made it look like a program that is really badly off track, but the missile itself has done very well and I think that is a point that we need to remember.

The missile tubes in the new Trident submarines were designed larger than required for the Trident I missile which allows us growth room to go to the modern D-5 missile which has been discussed this morning. This missile will provide the submarine leg of the Triad a cost effective capability against the total spectrum of Soviet targets SSBN's or the C-4 missile that has been backfitted into the Poseidon SSBN. They do not have a [deleted] capability, as you are aware.

We are embarked on a missile modernization program, as Dr. Zeiberg has described, which will allow us to make a decision in fiscal year 1983 as to what missile option we should go to. The three options include the big missile to fill the total Trident tube which would have greater accuracy than either of the other two options. The other two options are merely to upgrade the accuracy of the current C-4 missile and not add any range or any payload capability and a stretched-out C-4 which would take advantage of the length of the Trident tube but would not take advantage of the total volume.

As Admiral Carter has said, we have made this decision primarily from an affordability issue and we have discussed that it is about an \$8 billion bill in R. & D. alone to go to the big missile. I would hope that we would make the decision on which way we are going somewhere within the 1983 time frame so we could decide where we are going in the future.

I think that all of us feel that if we can get the money that is needed to do it the D-5 missile is the right way to go because it gives us a greater capability and balances the legs of the Triad.

In order to be able to get the accuracy for this missile we started an improved accuracy program in the 1975 time frame which completes this year. This is a technology program which was designed to provide us the technology to go into an engineering development phase and get the accuracy similar to what you have with ICBM's. As I say, that program completes this year.

Senator WARNER. Just one moment.

Admiral KELSO. Yes, sir.

Senator WARNER. I beg your pardon.

[Whereupon a brief recess was taken.]

Senator WARNER. Thank you, Admiral, for permitting that interruption.

Admiral KELSO. Yes, sir.

I will go back a minute to where I was, Senator, if I could. What I was trying to describe to you was the improved accuracy program which the Navy started on in about 1975, which is a program designed to provide the technology to get to a missile which would have the sort of accuracy that we have experienced in land-based forces or get in that range to give you the capability [deleted].

It provides the technology, if we get the decision to go that way, with reasonable risk to get the kind of accuracy that would be desired [deleted] I would stress it is not an engineering development but it is a technology development. We have to move into the engineering phase from here to get there, but we think we can do that with reasonable risk to get the accuracy we want.

In summary I would say that the sea-based leg of our deterrent is well today. It is at sea. As I told you earlier, its numbers of warheads and its destruction capability is improving.

One of the issues about Polaris, as Admiral Carter said, is a perception of a loss in our strategic capability. We have accomplished two things during this period that have improved our strategic capability. [deleted.] Plus the backfit of the Poseidon boat gives us a greater kiloton for the warhead and a greater range to fire and destruction capability.

That has allowed us, even with the Trident slip, and even with the Polaris phaseout, to maintain a better capability from a standpoint of targets destroyed than we had prior to that time. It gave us the feeling that going ahead with the Polaris phaseout was a smart decision to make and to put the money into modernization for a future year.

At the same time we are being stretched pretty thin in attack submarine forces for commitments in places like the Indian Ocean. By freeing these ships up for an SSN role it will help both the people problem and gives us more operating time in the far reaches of the world with those more capable ships.

Senator WARNER. What is the likelihood of those ships being converted to an SSN role?

Admiral KELSO. To an SSN role, sir?

Senator WARNER. That is what you just said.

Admiral KELSO. Yes, sir. Those that have already been converted are operating as SSN's today.

Senator WARNER. Is that right.

Admiral KELSO. Yes, sir.

Senator WARNER. And you propose to go with the additional ones?

Admiral KELSO. Yes, sir.

Senator WARNER. They were originally planned for a 20-year life, an exclusive core life. That has proven to be an underestimate, hasn't it?

Admiral KELSO. Yes, sir.

SUBMARINE OBSOLESCENCE

Senator WARNER. Do you think you can have another 10 years?

Admiral KELSO. No, sir, I do not think they will go another 10 years. I don't think they will go 30 years. I think there is a high technical risk in that for those ships.

Senator WARNER. What do you think the life span will be?

Admiral KELSO. I think around 25, sir.

Senator WARNER. So it is just another 5 years on top of the original 20.

Admiral KELSO. That is all we expect to operate them. To some extent it is driven by the core that is in them today. For instance, the two that we dismantled under the SALT I agreements, as we have followed up this time anyway, were out of fuel. It would have been very expensive to overhaul them. They were old ships and it just didn't make much sense to overhaul them for the time we were going to run them.

That is also the issue with putting SLCM in them. When you look at the cost to put SLCM into those ships it is a pretty healthy bill. We have estimated it to be around \$3 billion and there are some that argue with that. That is counting the missiles. Then to be able to operate them only 5 or 6 years is not a very cost-effective system. So the Navy looked at that last year and sort of rejected it on a cost-effective basis because we just couldn't operate them very long, although there are people that want to do that.

Senator WARNER. Within the submarine what are the construction features that are the limiting factors on that 25 years? Is it the hull or is it the wiring?

Admiral KELSO. Well, it is a lot of things. I don't know that I would pick any one limiting thing. Of course we have gone through a lot of technology programs over the years to try to look at how long things last from the standpoint of how far we can go between overhauls. And you find things like the piping systems erode, the pump casings erode and you get a reduction of piping thickness which you can't live with any more. The hull cycle I suspect, and I am going to refer this to Admiral Peebles, was probably conservative enough in design that the hull would go for 30 years.

One of the other major things, Senator, if submarines get old, like anything else, it gets very difficult to maintain them. It gets far more expensive and you have to replace more and more things all the time. And technology overcomes you with time in a ship.

Senator WARNER. One moment.

We welcome you, Senator Thurmond and your questions will be put in the record.

Senator THURMOND. Thank you, John. I had another commitment this morning.

Senator WARNER. The record will indicate that you were here this morning. Thank you.

Senator THURMOND. Thank you.

Admiral KELSO. It is hard on people to operate the older ships. For instance, these ships from the standpoint of self noise are noisier [deleted]. Does that answer your question, Senator?

Senator WARNER. I think that fully answers my question.

[The prepared statement of Admiral Kelso follows:]

PREPARED STATEMENT OF REAR ADMIRAL FRANK B. KELSO, II, U.S. NAVY, DIRECTOR, STRATEGIC SUBMARINE DIVISION, OFFICE OF CHIEF OF NAVAL OPERATIONS

Mr. Chairman and members of the committee, I am Rear Admiral Frank Kelso, Director of the Strategic Submarine Division of the Office of the Chief of Naval Operations. I will update this committee today on the current status of the

strategic submarine and missile programs. I also appreciate the opportunity to appear before this committee and to participate in your important work.

As Admiral Carter has stated, the relative invulnerability of our strategic submarine forces makes it the most survivable and enduring component of the nation's strategic Triad. We have completed nearly 1,950 strategic deterrent patrols by the end of 1980, and the submarine launched ballistic missile force is as secure today as when the George Washington deployed on the first patrol in November 1960. The strategic submarine force is at sea, today, doing its job. Submarines are on deterrent patrols, deployed from Holy Loch, Scotland, Kings Bay, Georgia, Charleston, South Carolina and Guam. The strategic capability of the sea leg of the Triad when measured in numbers of warheads and target destruction capability is improving and will continue to improve into the 21st century.

We presently have three classes of SSBNs deployed. The ten oldest SSBNs, the Polaris force, are being removed from active strategic service, as Admiral Carter indicated. Two are being deactivated and dismantled in accordance with the requirements of the SALT-I agreements. They will be decommissioned tomorrow. The other eight are scheduled to be converted to service as single-crew attack submarines. Three already have been converted, two are in the process of conversion and the remaining three will be converted over the next twelve months. As a result of the Polaris phase out, the Guam-based submarine squadron will be disestablished at the end of the fiscal year. The personnel which have been made available by the conversion to single crew attack submarines are easing the critical shortages in technical ratings throughout the submarine force.

Force modernization plans include both new submarines and new or improved missiles. Our original forty-one SSBN's were commissioned in an eight year period from 1959 to 1967 with a twenty year design life. However, an extended service life of thirty years has been determined to be feasible for the 31 Lafayette class SSBNs, and we plan to operate them for this period. The inability to backfit modern noise reduction techniques and ship systems into the present SSBNs, in addition to the lack of growth room for future improvements, place limits on their future capabilities.

To replace these ships, and to maintain the present invulnerability of our strategic submarine force into the twenty-first century, we embarked on the Trident shipbuilding program with authorization of the lead ship, *Ohio*. Since then, eight more Trident submarines have been authorized, with one being requested both this coming budget year and in fiscal year 1983.

The delivery of the lead Trident has been rescheduled by the shipbuilder for 29 June 1981. In October of last year, the shipbuilder notified the Navy that delivery dates for Trident submarines were "in a state of flux." Although no further slippage in the schedule has been announced, the Navy estimates that the 29 June 1981 delivery date will not be achieved, and that a more realistic delivery date will be late this year. The Navy expects revised delivery schedules from the builder shortly. We will keep you informed. The problems which contributed to the delays have been identified and hopefully solved, so that we can get on with the business of upgrading our submarine force. The deployment date for *Ohio* is dependent on the delivery date and on the amount of work that will have to be done in the post shakedown availability.

Although the Navy initially planned a Trident procurement rate of three ships every two years, the basic shipbuilding rate to date averages a little over one per year. However, in his fiscal year 1982 annual report to Congress, former Secretary of Defense Brown reaffirmed the goal to increase the building rate to three SSBNs every two years in fiscal year 1985.

The problem facing us is the retirement of the Poseidon submarines at the presently planned extended service life of 30 years. We must replace these ships with new submarines prior to their retirement in the mid-1990's. A Trident building rate comparable to that of the Poseidon ships is not required for several reasons: Each Trident is far more capable than the Poseidon, especially in terms of missiles carried and destructive capability; secondly, we are building Tridents in advance of the Poseidon's block obsolescence period. At presently planned building rates we will reach a level of 464 launchers in 1996. If the Trident building rate remains at one per year, the NADIR becomes 486 launchers in 1998. It should be also stated that force effectiveness will continually improve because of the improved accuracy and greater yield of the more modern missiles which will be carried in these launchers.

Turning to missile modernization, we have now progressed through five major sea launched ballistic missile developments. The Trident-I missile has been deployed on five of our Poseidon SSBNs. By September of 1982, a total of twelve Poseidon submarines will be operational with that missile backfitted. Trident-I provides these ships with the increased survivability inherent in the resulting greatly increased operating area provided by the missiles' increased range.

The backfit program also permits these submarines to cover potential targets immediately upon departure from their base at Kings Bay, Georgia, without the need for a lengthy transit, thereby reducing our dependence on overseas bases. The remaining 19 Poseidon SSBNs will continue to carry the very capable Poseidon (C-3) missile which is the backbone of our force today. The backfit program has provided flexibility in our strategic submarine program as well as the ability to deploy the Trident-I missile in the fleet, on schedule, despite Trident submarine construction delays. However, these Trident backfit SSBNs are not a substitute for the modern Trident submarines which will provide the force of the 1990s and beyond, and will have the potential for future missile growth capability.

The Trident-I missile (designated C-4) was deployed on schedule in October 1979 after the most successful test and evaluation program ever conducted on a submarine launched ballistic missile. The performance objectives in terms of the number and yield of re-entry bodies were met and missile range goals were exceeded. While the data base is still small it appears that system reliability and accuracy objectives have at least been met, if not likewise bettered. In constant dollars, each missile is being produced at a unit cost less than the original estimate, and the missile met its planned initial operational capability.

The missile tubes in the new Trident submarines were designed larger than the Trident-I missile required in order to take advantage of expected advances in missile technology and to provide growth room for follow-on missiles with greater capability which we could expect over the thirty year life of the submarine. We embarked on an advanced development program for a follow on missile with improved accuracy and payload characteristics which optimize the effectiveness of the Trident fleet in support of future national deterrence objectives.

This Trident-II missile would provide the submarine leg of the Triad with a cost-effective capability against the full spectrum of Soviet targets that Admiral Carter discussed through a combination of accuracy and payload improvements. Numerous studies have shown that a Trident submarine force, equipped with the Trident-II missile, would be a cost effective force. This missile requires significant funding in the early years after commitment to full scale engineering development. To expedite SLBM modernization, an advanced development program has been adopted which commences this year and culminates in fiscal year 1983 with a selection decision of a missile option which will support a calendar year 1989 initial operational capability.

This program was described to the chairman of the Armed Services Committee in the Secretary of Defense letter of March 7, 1980 and its accompanying report. This decision has been reconfirmed by Secretary Weinberger. This program has an improved accuracy goal while maximizing the range/payload parameters of a new missile designed to fill the Trident launch tube envelope. Designs for improved accuracy and range versions of the C-4 missile will be kept current during the program. The ongoing improved accuracy program which completes this year is providing a vital input into the advanced development effort. With completion of the improved accuracy program we will have, for the first time, the technology in hand for achieving the necessary accuracies that will permit broadening our SLBM mission objectives.

The new submarine base being constructed at Bangor, Washington, specifically to support the first Trident submarine squadron is nearing completion. Major base components include a Trident delta pier/drydock facility, a Trident refit facility which will conduct maintenance on Trident submarines, a Trident training facility and a strategic weapons facility. The submarine base at Bangor will become completely operational on 1 July 1981.

The three converted ex-SSBN attack submarines have been assigned to the submarine squadron at Bangor in order that the base and repair facility will keep its maintenance and support capabilities fully ready to support the delayed arrival of Trident. Trident crews are also being trained at the Trident training facility, and the strategic weapons facility is handling the Polaris missile sub-

marine conversions as well as building up for Trident. Thus, the base will be fully ready and in high gear when the first Trident submarine begins operational deployments from this site. The first operational unit in support of the *Ohio*, submarine squadron seventeen, was activated on January 5 of this year. As the Tridents are delivered to the Navy, the base will continue to grow through the mid-1980s, as is currently programmed in the five year defense plan.

With the projected Trident SSBN force level of at least fifteen submarines, it was recognized that additional basing facilities would be required. National strategic considerations, including the need to have modern SSBNs in both the Atlantic and the Pacific theaters to present a future two ocean ASW problem to the Soviets, strongly supported the construction of a Trident base on the East Coast of the United States.

After the completion of extensive strategic and environmental studies, the Secretary of the Navy announced on 23 October 1980 the selection of Kings Bay, Georgia as the location of the Trident Atlantic Coast strategic submarine base. Base construction will begin next year and will be completed by 1990, at a cost of \$1.4 billion and a peak construction employment of about 1,000 workers. This base completion date will support the establishment of the East Coast Trident submarine squadron in 1990.

In summary, the sea based leg of our deterrent is at sea today; its strategic capability will continue to improve as we increase the number of more capable Trident-I missiles in the force by backfitting Poseidon ships and deploying Trident submarines. We have an ongoing program to improve the missile capability to span the total target spectrum and, with your support, can predict with confidence that the sea based leg of the triad will carry its full weight into the 21st century.

Senator WARNER. All right, we will proceed.

Dr. ZEIBERG. I believe that is the end of our formal presentations. We are all now available for any further questions.

Senator WARNER. Dr. Zeiberg, I will let you suggest the order in which the witnesses address the issue, namely, substituting the at-sea missile for the MX. Why don't you frame that in your own way and call on the various witnesses who can put the record together on that issue.

Dr. ZEIBERG. Let me try to restate it.

TRIAD MISSILE CONCEPT

Senator WARNER. We are going to start with the initial concept that the Triad is preferable. I think there is adequate record that we are all of that opinion.

Dr. ZEIBERG. Yes. There is the question of the Triad and there is the second question of whether we should permit an adversary to drive us out of the capability which we find valuable for military reasons, in particular the military capabilities we have by maintaining a land-based system.

I for one, and others in the Department, believe that if we are convinced we need the military capability provided by a land-based system we must pursue such a system and do something to eliminate the vulnerability that will soon exist with Minuteman. We can't allow the Soviets to decide what our force structure should be.

Two days ago, in another hearing, we used the term "an act of submissiveness" if we did not respond by deploying a land-based system as a replacement for the vulnerable Minuteman system. I would like to repeat that in today's record.

The arguments for a land-based system are many. Of the technical arguments it is a very high accuracy, and a very secure and very direct

and very confident command and control. It has a very low profile in the sense that once in place it is relatively invisible. It has very low operating costs compared to any other element of our strategic forces.

This is the sum of the arguments that I would like to make.

Senator WARNER. Admiral Carter, do you wish to amplify that?

TRIAD COMPLICATES SOVIET ATTACK PLANS

Admiral CARTER. No. I think everything that Dr. Zeiberg has said is true. The addressal of the force mix problem for the future really has to hinge around the entering arguments. I think if you subscribe to the fact that a Triad or any sort of multifaceted force that complicates the Soviet attack problem is a useful thing to do and you also think that we should have a very large missile with a great deal of growth capability and throwweight then that leads you to maintaining a viable and robust ICBM force.

If you want to move away from those requirements, then there are other options.

HYDRA SYSTEM

Senator WARNER. Let's discuss the Hydra option and where we are, that is the Department of the Navy, today.

Admiral CARTER. The Hydra option, as you know, has been proposed by many. It has been looked at by the Navy, notwithstanding some statements to the effect that the Navy has not adequately looked at this and it has been some years since it was documented, but it was looked at in great detail. There are several large volumes extant that were put together under contract by Northrop at the end of the 6 years in which the Hydra experiments were carried on in the early sixties.

Technically, Hydra is possible. You can launch missiles from a floatation device in the ocean. However, there are a number of drawbacks to the system that the Navy has looked at, one of the greatest being that when you float a missile at sea and drop it off a ship or however you manage to launch it, you now no longer have direct control over the nuclear weapon with all the disadvantages that go with having a thermonuclear device floating around out there not under your immediate precise control.

If you put it on a surface ship to launch, the surface ships have the same vulnerability problem that you would have with a missile that would be launched directly from the surface ship under the surface ship MX concept. You have to decide whether you convince yourself and convince the world perceptually that you can keep enough of that force hidden from the Soviets at any one time to make it survivable.

Senator WARNER. I am going to ask you, in the interests of time, to put in a good, tight statement on behalf of the Department of the Navy in the record on this question. Flesh it out and give the whole argument pro and con for the Hydra launch and let's have it in the record.

Admiral CARTER. All right, we will do that.
[The information follows:]

HYDRA CONCEPT

Hydra has been looked at on numerous occasions over the last two decades. It was first examined as a potential launch technique for the Polaris submarine. Costs, reliability, technological risks, payload for a given volume, command and control aspects, potential threats and operational considerations were examined in some detail. Based on a consideration of these factors the Navy decided the bare launch, dry tube concept used in current SLBMs, and which will be used in the Trident submarine, was the preferred choice by a wide margin.

Since these early studies, the Hydra concept, which include encapsulation of the missile for launch from either a vertical or horizontal storage system on submarines or for launch from surface ships, has been reexamined several times. The most recently completed study on the subject looked at SUM which uses an encapsulated missile. As pointed out elsewhere in my testimony and answers to questions, this system is not competitive with Trident for a number of reasons. It is now being looked at in a study for the Secretary of Defense which is reexamining deploying MX on surface ships.

Hydra should not be viewed in isolation. It is an alternative launch concept and is only one of many technical trade-offs that must be done in system concept and design. To date, it has not proven attractive.

SUM

Senator WARNER. Then we turn to SUM which is another alternative. Without taking the time now would you likewise put that in the record, both pro and con. I want an objective analysis of both of these alternatives in the record.

[The information follows:]

The Navy SUM study concluded the concept to be technically feasible and to have many of the advantages endemic to SLBM's: namely survivability, endurance, low environmental impact, and crises/arms control stability. Nevertheless the concept is, on balance, unattractive for a number of reasons. I have outlined a few samples below:

Initial deployment could not occur before the early 1990s.

Such a concept has no actual significant advantage over conventional design ballistic missile submarines such as Trident.

Small submersibles are unlikely to be any less expensive than MX in multiple shelter basing mode and considerably more expensive than Trident on a basis of cost per surviving reentry vehicle.

Considerable technical risks are involved in some propulsion systems.

Personnel manning problems and cost of manning are higher than other proposals.

Consideration of the above factors, and many others including military effectiveness, survivability, operating flexibility, and cost effectiveness has convinced us that the Trident SSBN program should be the top priority effort to modernize the Navy's contribution to the strategic nuclear deterrent.

Admiral CARTER. For your information we are reexamining all of those. As you know, Secretary Weinberger asked Dr. Zeiberg to do this and we are participating in that.

Senator WARNER. I want to make it very clear that I respect the fact that the Secretary felt it was necessary for the Department of Defense to go back and reexamine these alternatives as a prelude to his responsibility on behalf of the President to come before the Congress and request the programs that he wishes to restore the nuclear strategic balance.

But I think it is important that our record contain a careful analysis of both of these systems.

Now, likewise the SLCM. Put in the pros and the cons and where we are on that.

[The information follows:]

SLCM OPTIONS

The Navy's analyses of the various SLCM options supports the conclusion that the SLCM has the accuracy, yield, range, and penetration capability to threaten a very significant variety of strategic and theater targets. The presence of ships at sea with SLCM would significantly complicate the Soviet calculation of the overall nuclear balance (both central and gray-area systems) and the probable consequences of initiating nuclear hostilities. The numbers and locations of the SLCM capable ships and their weapon loadout would create great uncertainty. Additionally, SLCM would be very useful to the nuclear CINCs as survivable and enduring nuclear weapon assets for theater employment, and surviving SLCM ships could make an important contribution during the war termination phase following a massive exchange of strategic nuclear weapons.

On the negative side of the ledger, there is concern in some quarters [deleted]. Another difficulty is that, although SLCM can contribute to the strategic balance perceptually and through the uncertainty it produces in the Soviet calculus, the SLCM platforms should not be committed to the Single Integrated Operating Plan (SIOP). To do so would result in an unacceptable loss of flexibility in the operation of our scarce general purpose platforms in their primary mission areas. We should not repeat the lesson learned years ago when our aircraft carriers were committed to the SIOP.

In summary, the Navy believes nuclear SLCM can make a very valuable contribution to the strategic and theater nuclear balance by virtue of its warfighting capability, survivability, and endurance. Intelligent policy and programming decisions can overcome the [deleted] SIOP commitment problems.

Senator WARNER. Why was the procurement of the SLCM cut back?

Admiral CARTER. The procurement of nuclear SLCM or?

Senator WARNER. Any SLCM.

Admiral CARTER. The procurement of any SLCM was cut back? I would like to take that for the record because I am not in the programmatic end of the business. Once the budget starts through the defense cycle I am not longer involved.

Senator WARNER. Thank you.

[The information follows:]

TOMAHAWK PROCUREMENT

Although the Navy's procurement requests for Tomahawk have been constrained by affordability considerations, they have not been cut back. In FY 1980 the Administration requested some long lead production money and Congress authorized the first six tactical mis-iles. In FY 1981 the Administration requested 20 missiles and Congress appropriated funds for 50. The FY 1982 budget submission called for 48 missiles as provided for in the FYDP. The new Administration has amended that number to 88. The number of SLCMs requested in DOD's submission has steadily grown, and in each case the Congress has responded with authorizations larger than the budget requests.

Dr. ZEIBERG. I think you will see some satisfying changes.

Senator WARNER. How soon can we expect to receive the study describing the approach which will be taken with regard to competition in the Trident II missile program which this committee requested last year?

Admiral KELSO. Senator, I would hope you would receive it fairly soon. Dr. Zeiberg tells me that he has received it and that the new administration has asked for a little time to review it before they report it to the committee.

I will let Dr. Zeiberg comment further on that if he would like.

Dr. ZEIBERG. The Navy submitted the report to me and I forwarded it to Secretary Weinberger with my personal endorsement recommending that we accept the Navy's conclusions on the matter.

Secretary Weinberger would like the new Under Secretary for Research and Engineering to take a look at it, at least informally, before it is forwarded. Dr. DeLauer, who is expected to be named for that position soon, will hopefully get to it within the next week or so when he is visiting Washington.

Perhaps the Navy would like to comment on what they recommended.

Admiral KELSO. Well, basically, sir, the Navy's comments or recommendations went forward that we stay with the type of contracting approach we have used in the past. All of our SLBM programs which I previously described this morning are the Strategic Systems Project Office's function as the Navy's prime contractor for missile development. The competition is provided at the subcontractor level rather extensively rather than at the intermediate contractor right under the SSPO echelon.

I might ask Admiral Clark if he would like to comment on that further since he is the Director of the Strategic Systems Project Office.

Admiral CLARK. I can identify the key features of the report as it has been submitted to the Secretary of Defense. First is the retention of the proven SLBM management structure that we have used in all previous generations. This involves the continuance of SSPO as the overall weapons system contractor and integrator.

We have also identified that we will pursue an evolutionary development strategy in the Trident II program to minimize the risk, to shorten the development period and to contain the total costs, an approach that has been followed in all of our prior programs.

We would intend to retain the existing Navy contractor subsystem management teams to get the most value from the previous research and development, particularly the improved accuracy program, and the experience and knowledge that exist in that contractor team particularly from the Trident I program.

We would use maximum competition at the subcontractor level consistent with the evolutionary nature of the program, the technical requirements and just plain good business practices.

We would intend to compete throughout the production phase of the new guidance system between two contractors who would be qualified during the engineering development program.

I think that summarizes the essence of the approach we will take.

Senator WARNER. Out of curiosity, is Adm. Levering Smith still officially associated with the program?

Admiral CLARK. Well, not officially. He retired in November 1977.

Senator WARNER. Well, I know that, but I mean on a consultant basis.

Admiral CLARK. Oh, yes, we are not bashful in consulting him.

Senator WARNER. I am delighted to hear that. He is really one of the unsung heroes in the history of our Nation.

Admiral CLARK. I couldn't agree with you more. I worked for him for 11 years directly so I obviously admire him greatly.

Senator WARNER. Are you then the immediate successor to him?

Admiral CLARK. No; Adm. Bob Wertheim relieved him in November 1977.

Senator WARNER. No; not the immediate, but I mean you are the direct lineal descendant.

Admiral CLARK. I am now the Director. I got that job in November of last year.

Senator WARNER. That is marvelous.

I am going to ask one more question, Dr. Zeiberg, and you and Admiral Carter can put this response in the record. I assure you that I do not do it for any political reasons. But, as you know, so much of our work here in the Congress relates to public perceptions and we have been discussing the enormity of the R. & D. costs for the new missile systems, problems connected with the *Ohio* class and the cost overruns. Occasionally our officials, whether they be the President or the others in the executive branch, will make statements which just confuse the public.

This statement has always given me a certain amount of confusion, and I would like to have it clarified this year should I be confronted with it during the debate. It was made on January 23, 1979, by President Carter. It appears on page H226 of the Congressional Record of that date, and I quote.

The American nuclear deterrent remains strong after SALT II. For example, just one of our relatively invulnerable Poseidon submarines—comprising less than 2 percent of our total nuclear force in submarines, aircraft and land-based missiles—carries enough warheads to destroy every large and medium-sized city in the Soviet Union. Our deterrent is overwhelming and I will sign no agreement unless our deterrent force remains overwhelming.

Then it is indicated here that he received resounding applause.

Would both you and Admiral Carter address that statement as to how you understand it in the context in which it was made because it will be raised again.

[The information follows:]

STRATEGIC CAPABILITY

Dr. ZEIBERG. Senator Warner, the same question was asked of Secretary Brown several years ago and I think his answer then is still appropriate.

"The President's remarks were made to highlight the impressive deterrent and retaliatory power embodied in our SLBM force. Each Poseidon submarine currently carries [deleted] warheads, and there are approximately 145 cities in the Soviet Union with a population in excess of 200,000. You can be sure that the President, as a former submariner appreciates the operational limitations of missile range and target dispersal and meant his statement to be taken as illustrative rather than literal."

DETERRENCE OF SOVIET UNION

Admiral CARTER. In my mind, the President's statement consisted of two parts: The premise in which he referred to the destructive capability of a single Poseidon submarine, and the conclusion he based upon the premise. Some have critically pointed out that the premise was flawed because of technical targeting considerations that were ignored and therefore the conclusion was invalid. There is no question about the fact that the large number of nuclear warheads carried on one of our Poseidon submarines could do enormous damage to Soviet cities and cause millions of casualties should they be so targeted; therefore, I would not fault that part of the President's statement based on technicalities given the context in which it was used. Nevertheless, I am uncomfortable with the conclusion that our ability to wreck havoc on Soviet cities is, per se, an "overwhelming" deterrent. It certainly would be viewed through the eyes of most Americans, but there is real danger in judging an adversary by your own standards, or for that matter on the assumption that national behavior necessarily reflects the sum of individual judgments. History is filled with tragic examples of irrational national actions. It is my opinion that deterrence is substantially strengthened by a policy,

supported by carefully structured operational plans and the force structure to carry them out, that lets the world know the President of the United States can respond appropriately at every level of violence so a potential enemy could not devise a scenario where he would have a reasonable expectation of net gain through the use of nuclear weapons. This requires more than the present capability of our submarine force to hold cities hostage.

Senator WARNER. Now, Dr. Zeiberg, before we close are there any of your other colleagues who have attended this hearing this morning that might wish to make a statement for the record?

Dr. ZEIBERG. None are prepared.

Senator WARNER. Why don't we call on each by name and identify his responsibility so that the record reflects their attendance this morning.

Admiral LOCKE. I am Rear Adm. Walter Locke. I am the Director of the Joint Cruise Missiles Project Office.

Senator WARNER. Admiral Locke, is there anything with respect to your area that you feel should be included in this record?

Admiral LOCKE. I think our capability to expand the sea-launched missile programs could be included in the record and we will supply it for the record.

Senator WARNER. All right. We will have questions of course.
[The information follows:]

SEA-LAUNCHED MISSILE PROGRAMS

Executive Summary of Tomahawk Acceleration Potential

A strong industrial base to manufacture Tomahawk (SLCM, GLCM and MRASM) and all common subsystems of the ALCM and Tomahawk (engines and guidance units) has been established to attain the required production rates. Through aggressive management efforts of the Joint Cruise Missiles Project (JCMP), additional production surge capability is being secured which enables JCMP to unequivocally attest to a low schedule risk for any acceleration of SLCM with no impact to the current ALCM and/or GLCM programs.

Air Vehicle

General Dynamics/Convair (GD/C) Division is the air vehicle associate contractor for Tomahawk missiles located in San Diego, California with manufacturing facilities and sites which provide an integrated capability for research, design, development, testing and high rate production of Tomahawk Cruise Missiles. The significant commonality between all versions of Tomahawk air vehicles to be produced enables GD/C to provide this integrated approach to manufacturing. The manufacturing methods and tools developed and proven during development will be used in the production program for all versions.

Approximately \$50 million dollars of General Dynamics capital funds have been spent or committed on facilities for the cruise missiles programs. Five major plants, four of which are used in Tomahawk cruise missile production, are operated in the San Diego area, encompassing six million square feet under roof. The Lindbergh facility is used primarily for sheet metal fabrication, processing and manufacturing engineering activities. Plant 19 does machined parts fabrication and is in the midst of machine consolidation and update which will result in one of the most modern numerical controlled machine centers in the country. The Kearny Mesa facility is primarily final assembly and testing but also includes a majority of the program and engineering offices. Finally, the Sycamore Canyon facility is currently a shared warhead installation facility with General Dynamics Pomona Standard Arm Missile Production. A new 35,000 square foot plant is planned in the same area for Tomahawk warhead storage, installation and depot level maintenance, recertifications and refurbishments.

General Dynamics cruise missile production capacity is currently five (5) missiles per month limited by machine tooling. The 1981 production contract increases that capability to 15 missiles per month with the limitation being tooling,

test equipment, fuel and paint facilities. A 60 per month capability is available given a 36 month rate acceleration plan lead time. General Dynamics facilities support a 120 per month capability with a second source contributing an additional 20 per month beginning in CY '84.

Engine

Williams Research Corporation (WRC) is the F107 cruise missile associate contractor for the Tomahawk (SLCM and GLCM) and ALCM programs. WRC was founded in 1954 with the objective of designing, developing and manufacturing small gas turbine engines. Since its founding, the company has pursued the development of advanced technology and manufacturing expertise along with the development of some of the most advanced and modern test and manufacturing facilities for small turbine engines in the world. WRC has invested a substantial amount of capital in facility and systems modernization and has plans to continue to spend over \$25 million to support cruise missile production rate capability beyond 60 engines per month by the end of calendar year 1983. Also, WRC has indicated a willingness to invest an additional \$20 million in capital investment over the next five years for technology modernization to enhance the productivity of the cruise missile engine which has a potential total life cycle cost savings of \$400 million.

The Wallied Lake corporate headquarters contains approximately 200,000 square feet of area and is the hub of WRC's research, development, and business activities. It has a completely segregated experimental shop as well as production facilities. WRC-Ogden facility presently consists of approximately 90,000 square feet of modern, well-equipped factory area and office space for management and production. The recently added 40,000 square feet of production space is presently being occupied three months ahead of schedule.

Early concerns of the Under Secretary of Defense for Research and Engineering about the Cruise Missile Engine Program included the need to protect the national security posture through the development of a redundant engine production capability and the desire to instill competition into the program. In the 1977/78 time period, the JCMPO initiated a program to accommodate these concerns. Their initial approach centered on the development of an alternate engine to the F107. Conservative estimates at that time for the development of a new engine ranged between \$100M and \$200M with projection engine deliveries estimated 4 to 5 years hence.

Early in 1978, WRC proposed, as an alternative, to establish a Licensing Program with an existing gas turbine engine manufacturer, selected through competition, to produce its F107 engine for Cruise Missile applications.

The benefits of such a program to the Government are numerous. A few of the more significant are:

- Achievement of an additional manufacturing capability (complete engines and individual components) at a fraction of the cost of developing an alternate engine.

- Substantial reduction of both the risk and the time period of achieving production deliveries as compared to the development of an alternate engine.

- Significant improvement of reliability and reduction of production costs by cross-fertilization of technology between WRC and its licensee.

- Introduction of a competitive environment in terms of technology exchange and schedule accomplishment which will inherently reduce the relative cost to the Government.

- Maintenance of a single engine configuration thus minimizing administration costs, inventory management costs, and operation and support costs.

- Provision for competitive cost analysis of like components from two sources.

The JCMPO, encouraged by the opportunity to reduce cost and risk while ensuring redundancy and schedule acceleration, concurred with the WRC proposal and authorized its implementation in early 1978. After considering several of the major engine producers within the United States (jointly with the JCMPO), JCMPO authorized WRC to enter into an agreement with Teledyne CAE (TCAE), Toledo, Ohio for a Technology Transfer Program leading to their substantiation as an additional production source for the F107 engine. TCAE's background and experience in the production of over 12,000 jet engines for both manned and unmanned aircraft make them a viable licensee to effect the benefits of the Program.

The Technology Transfer Program was structured in three phases. The first two phases were to manufacture parts for substantiation by WRC in a WRC-built engine. In the third phase TCAE will manufacture parts and assemble and test their own engine.

At this point the majority of Program problems have been solved, hardware costs are actuals, and the remaining risk in the Program has been greatly reduced. There are no insurmountable obstacles to completing the Technology Transfer Program and thereby substantiating TCAE by the original and contractual date of December 1981. The first fiscal year 1980 production engine delivery is scheduled for December 1982 from TCAE. TCAE is presently under contract to support a total tooling rate of 30/month by calendar year 1983.

The cruise missile engine requires 27 months lead time because of two major pacing long lead material items (titanium forgings and cobalt based materials) even with the DX-A2 Brickbat defense material rating. The current engine capacity supports 20/month. WRC and TCAE will support 60/month (CY 1982), 90/month (CY 1983) and 120/month (CY 1984).

Guidance

The Tomahawk guidance hardware is presently produced by the McDonnell Douglas Astronautics Company in St. Louis, Missouri (MDAC-St. Louis), and is delivered to the Missile System Contractor (MSC), GD/C in San Diego, California, for integration with the Tomahawk Cruise Missiles. MDAC-St. Louis performs the final assembly, integration and test. Two other major subassemblies, the Reference Measurement Unit and Computer (RMUC) and the Missile Radar Altimeter (MRA) are manufactured under dual-source subcontractor arrangements presently managed by McDonnell Douglas under the fiscal year 1980 production contracts.

The RMUC contractors are Litton Guidance and Control Systems, Incorporated, located in Woodland Hills, California, and Litton Systems Limited in Toronto, Canada. The MRA is subcontracted to Honeywell International, Minneapolis, Minnesota, and Kollsman Instrument Company, in Merrimack, New Hampshire.

The ALCM Guidance Hardware consists of two separate assemblies—the Inertial Navigation Element (INE) and the Missile Radar Altimeter (MRA). The INE has a different form factor than the RMUC, but shares a 95 percent parts commonality. The MRA is identical to that used in the ALCM/GLCM and SLCM programs. The INE is also manufactured by Litton Guidance and Control Systems Incorporated and Litton Systems Limited. MRAs and INEs are delivered directly to the ALCM System Contractor, the Boeing Company of Seattle, Washington, for integration with the AGM-86B Cruise Missile. The fiscal year 1981 and all follow-on production contracts with Litton Industries will be direct buys from the JCMP.

The current capacity for guidance sets supports 10/month (Land Attack). We are developing an industrial base to support 60/month (CY 1982), 90/month (CY 1983) and 120/month (CY 1984). These rates include two redundant sources.

For the anti-ship variant of the cruise missile, there currently exists a capacity for 50/month which supports Harpoon/SLCM requirements. The JCMP is presently developing a stand alone source at Texas Instruments for anti-ship guidance sets at 15/month by 1983.

Booster

Atlantic Research Corporation is the major subcontractor to GD/C for the rocket motor booster assembly and they presently have the industrial capacity to deliver 20 boosters per month. The JCMP is developing an industrial base by use of a second source to support 60/month (CY 1983), 90/month (CY 1984) and 120/month (CY 1985).

Conclusion

The industrial capacities and production rates presented in this narrative have been verified by JCMP on-site Production Readiness Reviews (PRRs). The results of the PRR by a team of 50 qualified DOD, Air Force, Navy and selected consultant experts reflect high confidence in the industrial capacities outlined in this report. The conclusion reached is that the JCMP has developed a viable production base to support the existing production rates and a low schedule risk to accelerate the Tomahawk Cruise Missiles Program.

Senator WARNER. Admiral Carter, you have spoken up fully and very professionally this morning, I might add.

Yes, and you likewise, Admiral Kelso and Admiral Peebles.

Admiral PEEBLES. I am Rear Adm. Edward Peebles. I am the Deputy Commander for Submarines for the Naval Sea Systems Command.

Senator WARNER. Have we covered your area to your satisfaction?

TRIDENT CONSTRUCTION DIFFICULTIES

Admiral PEEBLES. Dr. Zeiberg indicated the construction difficulties on Trident with which I am conversant. You indicated that there would be further discussion on that.

Senator WARNER. Well, I would appreciate as a part of this record if you would put in a very detailed statement comprising the problems that you have encountered, how they have been treated publicly, what the public perception is of those problems and what the Department of the Navy intends to do to correct them. Of course, Dr. Zeiberg has addressed that, but that is going to be a raging debate. I want a record that I can utilize in that debate.

I might indicate that it is my present intention, and I will consult with my chairman, Chairman Tower, and members of this committee, but in all likelihood we will ask Admiral Rickover to be present at a subsequent hearing on this issue.

I will of course take counsel with the Secretary of the Navy because I must be cognizant of the parallel legal implications here. But if we are to go before the Senate to obtain the additional funds for the program as now planned and even entertain the accelerated alternatives we have got to have a good record and you will assist in that, Admiral.

[Additional information follows:]

SUBMARINE SHIPBUILDING PROGRAM AT ELECTRIC BOAT

The Trident submarines under construction at Electric Boat have experienced considerable delivery delays. The following discussion provides an overview of the status of the Trident program at Electric Boat and the problems that have contributed to these delays. In consideration of the fact that Electric Boat is also under contract with the Navy for fourteen SSN 688 Class submarines, a discussion of this program is also pertinent in view of the interrelationship of these construction programs.

As shown on Chart 1, nine (9) Trident submarines have been authorized and funded with one additional submarine requested in the fiscal year 1982 budget. Contracts have been awarded to Electric Boat for the first eight ships. Delivery of the first Trident is projected for December of this year.

CHART 1

TRIDENT AND SSN-688 CLASS SUBMARINE AUTHORIZATIONS

	Program year—													
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982 ¹	
Trident submarines.....					1	2	1	1	2	0	1	1	1	
Total.....					1	3	4	5	7	7	8	9	10	
SSN-688 class submarines.....	3	4	5	6	5	3	2	3	1	1	2	2	2	
Total.....	3	7	12	18	23	26	28	31	32	33	35	37	39	

¹ Budget request.

Chart 1 also shows the total SSN 688 Class program. Thirty-seven (37) have been authorized and funded with two additional submarines requested in the fiscal year 1982 budget. Contracts have been awarded for the first thirty-three (33). To date, eleven (11) have been delivered; five (5) from Newport News and six (6) from Electric Boat. Ships of SSN 688 Class under construction are eight (8) at Newport News and fourteen (14) at Electric Boat. Five SSN 688 Class submarines are projected for delivery during the remainder of 1981; two from Newport News and three from Electric Boat.

There have been a number of problems at Electric Boat that have delayed the delivery of both Trident ballistic missile submarines and SSN 688 Class attack submarines. Quality control problems including the acceptance and use of grades of steel not in accordance with requirements, incomplete and unsatisfactory structural welds and missing and improper weld inspection records have been the principal contributors to these delays. Repairs to equipment furnished by the Government and the added work or rework associated with design data revisions have contributed to the delays to a lesser extent. Each of these problem areas will be addressed and placed in proper perspective, including their relative impact on the delays in the delivery of these submarines.

Before proceeding, two important facts must be mentioned. First, the breakdown in Electric Boat's Quality program did not extend to the submarines' pressure hull; Electric Boat has met the more rigorous quality requirements for pressure hulls. Secondly, all problems that could potentially compromise the safety of the submarines have been, or will be, corrected prior to the first sea trials.

SUMMARY OF NONCONFORMING STEEL PROBLEM

Both 688 and Trident new construction submarine designs specify a certain grade of weldable mild carbon steel (equivalent to industry specification ASTM-A36) for many non-pressure hull applications including some where a lesser strength steel could be used. This approach simplifies the design process, minimizes the number of procurement actions, reduces storage and control requirements, reduces the number of required welding techniques and procedures, minimizes the potential for human error in installing the wrong steel during construction and, accordingly, should reduce total costs.

In November 1978, an Electric Boat employee discovered some steel bar stock whose color coding was not in agreement with the color code for the grade of steel it was specified to be. Improper grades of steel could pose a variety of problems in ship construction. For example, it may not be strong enough for its specific end use, or the chemical content could preclude its use in welded applications. Accordingly, Electric Boat in November 1978 commenced a warehouse audit to investigate this case of improperly color coded steel.

In May 1979, Electric Boat notified the Navy of the results of this audit, reporting that five sizes of carbon steel bar stock had been found that did not have chemical properties in accordance with Electric Boat's purchase order requirements. A review of purchase and receipt inspection practices for this steel revealed that Electric Boat had accepted steel which did not meet specification and purchase order requirements. In some cases the steel was accepted even though reports furnished by the vendor with the steel indicated that it did not conform to requirements. Once these non-conforming grades of steel were placed in the warehouse inventories and commingled with other steel stock, it was no longer possible to easily distinguish them from conforming steel.

By July, additional investigations indicated that the problem was not limited to the five sizes initially identified by Electric Boat, but also included many other sizes of steel which could have been installed in as many as 61,500 locations in SSN 688 Class Submarines or 126,000 locations in SSBN Trident Class Submarines.

Electric Boat's actions to determine the extent of commingling of conforming and non-conforming grades of steel included a review of purchase orders to establish the probable time frame of the problem and the quantity, sizes, and grades of steel involved. Extensive sampling of existing inventories was then performed to determine the grades of steel on hand which may have been substituted for the required steel. A total of 127 sizes and shapes of raw material stocks were eventually found to have been contaminated with 15 grades of non-conforming steel. Subsequently, all raw material stocks of this steel were impounded by Electric Boat and were not used unless correct material requirements were first verified.

Once the grades of steel were identified, their applications were considered. A list of specific applications on each ship and a list of all ships on which the non-conforming grades of steel could have been installed were developed.

The approach used to resolve the problem was to determine which grades of steel in the warehouse inventories were the least weldable (the ability of the steel to be satisfactorily attached to other metal by a welding process) and the lowest strength. These were then used for subsequent testing and analysis. If tests of these "worst case" grades of steel proved satisfactory, the other grades of steel that had been identified could also be accepted. This testing indicated that the strength of some grades fell below that of the required steel. A design review of submarine applications was conducted to determine which applications did not require the full strength of the specified steel.

Considering the weldability of the non-conforming grades of steel, the investigation identified some steel where the carbon or sulphur content was excessive. High carbon content could result in the area adjacent to the weld becoming embrittled thus reducing its resistance to fracture failure, while the presence of sulphur in these grades of steel could promote cracking during the thermal cycles of welding.

All items then underwent an engineering evaluation for acceptability in their particular shipboard application. Electric Boat classified as "critical" any application where weldability was not satisfactory, where strength was not satisfactory, or where the item was used in a pressure containing system. A total of 452 items were classified by Electric Boat as "critical." Applications determined to be "critical" were checked to verify if a non-conforming grade of steel was installed. If installed, the item was either replaced or reinforced. The reinforcement option required waivers to the contract specifications since a non-conforming grade of steel would remain installed in the ship. Corrective action by Electric Boat and the submittal of waiver requests continued until mid-1980.

For those applications of the non-conforming grades of steel that were not critical, Electric Boat submitted requests for waivers to the contract specifications together with supporting technical justification.

Electric Boat has since taken actions to strengthen their quality program in the areas of receipt inspection and material control for structural steel to preclude further installation of non-conforming grades of steel.

Throughout this time period the Navy monitored Electric Boat's actions and set up special procedures to expedite approval of Electric Boat requests for waivers to contract specifications, both at NAVSEA and at the SSN 688 Class design contractor, Newport News.

A precise estimate of delays in ship deliveries attributable to this problem is not available due to possible concurrent delay; however, in a letter to the Navy in November 1979, Electric Boat provided dates by which SSNs 697-699 could have been delivered taking into consideration only the correction of the non-conforming steel problem. These dates reflected delays in delivery of these three submarines of two, four and one month respectively.

SUMMARY OF STRUCTURAL WELDING PROBLEM

In early December 1979, a quality assurance auditor from the Supervisor of Shipbuilding's office discovered some incomplete structural welding on SSN 698 which Electric Boat had previously recorded as complete and satisfactorily inspected. By late December, the Supervisor had identified other deficient structural welding in the areas of frame to hull inserts, attachments to frames, and deck stanchions on SSN 698 and on SSNs 699 and 702 as well. With the discovery of these deficiencies, prudence dictated that the Navy consider that all structural welding was suspect. Electric Boat was requested to give urgent action to a program of additional inspections and reviews to assure satisfactory structural welding prior to Sea Trials of SSN 698.

Electric Boat initially reported that the welding problem was the fault of one, then later two, inspectors who had not adequately inspected the welding. In early January 1980, Electric Boat outlined its program to review the work of these inspectors and stated, based on the status of the review, that preparations for SSN 698 sea trials should be postponed. In a mid-January letter to NAVSEA, Electric Boat advised that the weld review had disclosed a further problem that some of the structural welding record folders contained no records to establish that the required inspections had been performed, and that Electric Boat would

now inspect the more significant accessible welds. The letter stated that the scope of the inquiry would include all ships under construction at Electric Boat.

Concurrent with Electric Boat's structural weld review program, the Supervisor's office was conducting independent audits of welding in various structural areas. Pressure hull areas were found to be satisfactory, however, numerous additional defects and missing records were identified in non-pressure hull areas and reported to Electric Boat.

In late January 1980, NAVSEA, as a result of the increasing number of reports of defective structural welding and missing welding records requested Electric Boat to provide information concerning the scope of their investigation. NAVSEA also advised Electric Boat that any work and inspections not in accordance with the specifications, but which Electric Boat considered satisfactory should be formally submitted to the Navy with supporting engineering justification to permit the Navy to evaluate granting of a waiver to the specifications.

In early February 1980, Electric Boat informed the Navy that the work of two additional inspectors might be inadequate and indicated that further re-inspections were being conducted. Late in February 1980, Electric Boat indicated that after a detailed evaluation, the performance of the four inspectors was considered average and no longer suspect.

The Navy Supervisor of Shipbuilding at Groton, in a letter to Electric Boat, advised that this conclusion was not acceptable in that it treated each defective weld as an isolated case and did not consider related occurrences which could indicate a pattern of quality control deficiencies which would require expansion of the investigation.

The high percentage of welds for which the required inspection records were missing was revealed when Electric Boat at a briefing in early March, advised that they had sampled 137 structural drawings and checked for the corresponding inspection records. Records for 51 drawings (37%) were not retrievable. The Navy had to consider that if the records were not available, the proper inspections had not been accomplished.

The Navy again advised Electric Boat that if evidence of satisfactory welds could not be produced, Electric Boat should submit requests for waivers to contract specification backed by supporting technical justification. In mid-May, Electric Boat began a more comprehensive approach to the total welding problem by submitting an overall program to comply with specification requirements for structural steel welding for SSN's 698-702. The Navy approved Electric Boat's overall weld review program in August for the SSN's 698-702 and in September 1980 for SSBN 726. In December, Electric Boat notified the Navy that the program was being extended to SSN's 703 and 704, and SSBN's 727 and 728.

After completing their review Electric Boat in their 26 September 1980 and 17 February 1981 letters, submitted a report of the results of the SSN 698 and SSBN 726 weld reinspection programs which gives some insight into the magnitude of the problem. Out of 17,792 welds in the SSN 698 requiring Magnetic Particle (MT) inspection, 7,962 (45 percent) did not have inspection records; 6,893 of these were accessible and were reinspected; 2,802 welds required repair (27 percent of those reinspected). Out of 36,149 welds on the SSBN 726 requiring Magnetic Particle inspection, 9,693 (26.8 percent) did not have inspection records; 8,476 of these were accessible and were reinspected; 2,772 welds required repair (33 percent) of those reinspected). In addition to these, Electric Boat also reinspected and repaired numerous welds that required visual inspection only.

In summary, a review of the defects identified during the weld reinspection program indicated a serious breakdown in workmanship and quality control in structural welding. Not only were plan requirements not followed and jobs left incomplete but deficiencies that affected all ships under construction were not detected by the quality control procedures at Electric Boat. The Navy expedited technical review of waiver requests and tasked the SSN 688 Class Design Contractor, Newport News, to review the technical rationale for the waivers to minimize schedule and cost impacts of these problems.

For those five SSN 688 Class submarines (SSNs 690, 692, 694, 696 and 697) already delivered by Electric Boat the Navy imposed operating restrictions until the ships could be drydocked and inspected for welding defects that could compromise their safe operation at design depth. These inspections have now all been performed. For these same submarines, Electric Boat was requested in October 1980 to develop a plan of action for each individual ship for identifying

evaluating, and correcting where necessary, all not yet identified structural welding deficiencies. This plan has not yet been provided by Electric Boat.

As with the non-conforming steels, a precise estimate of the delay in ships deliveries attributable to the welding problem is not available due to possible concurrent delays; however, the Navy's assessment is that the welding problem has caused delays in delivery of submarine SSNs 698-705 and SSBNs 726-728. The SSN 698, under construction at Electric Boat, was preparing for sea trials in December 1979 when this problem was first discovered and sea trials postponed. This ship eventually delivered in February 1981, a delay of one year. Follow SSN 688 Class and Trident submarines experience lesser delay's dependent upon their status of construction when the problem was uncovered, with submarines nearest to completion experiencing the longest delays.

MISCELLANEOUS QUALITY ASSURANCE PROBLEMS

The following are brief descriptions of additional quality assurance problems that have occurred at Electric Boat over the past several years.

Material identification and control problem.—In December 1976 while a seawater system was being readied for dockside operation on SSN 694, a threaded plug fell out of a piping system resulting in about 400 gallons of seawater entering the engine room. The threaded end of the plug had corroded away because it was made of steel instead of the required nickel-copper alloy. Subsequent investigation in other areas revealed scattered cases of incorrect material, or incorrectly marked material, that had been used in seawater systems. Enough deficiencies were found to warrant continuance of the inspection program on this and all other submarines under construction at Electric Boat. On that basis rechecks were made of seawater plugs and all critical piping material on all SSN 688 Class submarines being built at Electric Boat. These post installation checks were made using simple nondestructive tests and are continuing today on all submarines being built at Electric Boat.

Direct work orders.—In August 1980 missing deck structure was discovered in SSN 698 during the course of the structural weld review program. This work was originally scheduled to be done at Electric Boat's Quonset Point facility but was transferred for accomplishment to the Groton facility. Investigation revealed that on both the SSN 698 and on the SSN 699 other minor structure that was to have been transferred was, in fact, not installed. The root cause of this problem was lack of accountability and follow-up to verify that work transferred to Groton was accomplished. Corrective and preventive action has been taken by Electric Boat on this issue.

Improper paint.—In September 1980, the Navy was informed that improper paint was being applied on SSN 688 Class submarines. Many areas were discovered where improper paint had been used. Corrective action included stripping and repainting some areas. Where technically justified, the Navy waived contract specification requirements and accepted the non-conforming paint.

Defective painting.—In December 1980, Electric Boat submitted a waiver request to the Navy to defer final painting of the ballast tanks on the lead Trident submarine (SSBN 726) until the first drydocking following delivery of the submarine to the Navy. The request for waiver to the specification advised that painting of these tanks prior to delivery would place an extraordinary burden on Electric Boat's paint department and would delay delivery of the ship. Concerned about preservation of these tanks, the Navy assembled a team of paint experts who inspected these ballast tanks and uncovered extensive paint system defects. The Navy estimated that approximately twenty-five percent of the total surface area of these tanks would have to be reworked to assure adequate preservation. Accordingly, the Navy disapproved Electric Boat's waiver request. Electric Boat has provided the Navy with a list of specific actions that are being initiated to correct quality program problems in the painting area.

QUALITY ASSURANCE

The problems of non-conforming grades of steel, incomplete welding, missing weld inspection records and the other problems previously addressed indicate that Electric Boat's quality assurance program was not performing the functions required by the contract.

The contract requires the shipbuilder to establish a quality assurance program in accordance with a military specification (MIL-Q-9858A) entitled "Quality Program Requirements". The Navy adopted this specification in 1969 for all submarine new construction contracts. This specification was originally developed by the Department of Defense in 1959 in response to a recognized need for a structured approach to quality assurance for complex weapons systems and had subsequently been widely accepted throughout the defense industry. This specification requires that the contractor plan and execute a comprehensive quality assurance program. Specifically, programs must be developed to assure conformance to contract requirements through the control of all work operations and manufacturing processes, as well as through inspections and tests. All supplies and services furnished under the contract, whether manufactured or performed within the contractor's plant or at any other source, must also be controlled to assure compliance with contractual requirements (this includes control of purchased materials). Electric Boat Division of General Dynamics undertook those obligations in its contracts for the SSN 688 Class and SSBN Trident Class submarines.

In April 1980 the Supervisor of Shipbuilding, in a letter to Electric Boat, expressed the Navy's concerns regarding Electric Boat's quality assurance programs; in particular, that proper emphasis was not being placed on certain areas of quality assurance and that deficiencies uncovered were being reviewed as isolated events without identifying the full scope of the problem and its underlying causes.

In May 1980, Electric Boat replied to the Supervisor's letter with a self assessment of Electric Boat's Quality Assurance program, documenting the actions being taken by the company to resolve the welding and non-conforming steel problems, and addressing new high technology systems in use at Electric Boat in support of their quality assurance program. Electric Boat's basic position was that the company's quality program is and always has been in compliance with MIL-Q-9858A since that specification was first invoked in 1969.

The Navy, still concerned at the extent and seriousness of the carbon steel and structural welding problems and the implication of more general quality assurance program deficiencies, conducted audits of both Electric Boat's and Newport News' quality programs. The audit at Electric Boat was conducted in June 1980. The NAVSEA audit report noted many weaknesses in Electric Boat's quality program but provided an overall evaluation that the basic procedural elements of a quality system existed. However it was also NAVSEA's evaluation that there was not adequate implementation and execution of those elements and there was a notable lack of emphasis on trend analysis and corrective action before deficiencies are identified in the completed product. Electric Boat has placed emphasis on cost and schedule performance and a policy of personal accountability for work assigned, which are important elements of a strong quality program; however, without effective audits, data analysis and positive corrective action feedback to discipline the system, the program cannot be truly effective and economical, nor can it be in full compliance with MIL-Q-9858A.

In August 1980 Electric Boat responded to the Navy's audit report. While accepting some of the Navy's recommendations Electric Boat did not concur with many of the recommendations and again stated that Electric Boat had always considered its quality program to be in compliance with MIL-Q-9858A since that specification was first invoked. In September, NAVSEA reiterated those areas where the evidence indicated that Electric Boat's quality program required improvement.

In late October 1980, Electric Boat generally agreed to changes that the Navy considered necessary to bring their quality program into compliance with MIL-Q-9858A. Major quality program changes included: (1) an additional audit program for work completion; (2) use of departmental overview audits; (3) additional attention to effective audits, data analysis and corrective action feedback; (4) use of process, defect and variance analysis; (5) additional resources to increase the frequency of surveys of the quality program of rated vendors and (6) restructuring and expansion of quality audit activities. A revised "Quality Program Management Plan" incorporating these changes was also developed and provided to the Navy. NAVSEA reviewed Electric Boat's revised program and in November 1980 notified Electric Boat that their plan was acceptable.

The latest Trident submarine contract with Electric Boat incorporates this

revised Quality Program Plan and also requires periodic audits by the Government of the contractors Quality Program for compliance with MIL-Q-9858A and quarterly Quality Program management meetings between the contractor and the Government.

If the actions that were eventually agreed to by Electric Boat had been taken immediately upon the first indication of problems with the non-conforming grades of steel and incomplete welding, the full scope of these problems and, therefore, their eventual correction, would have occurred in a more timely fashion. The overall delay of the ships could have been shortened if the proper emphasis to problem identification had been exercised by the contractor.

REPAIRS TO GOVERNMENT FURNISHED EQUIPMENT

During the construction of SSN 688 Class and Trident submarines, a problem with the main propulsion turbines on both classes of ships was discovered. The turbines are procured by the Navy from General Electric Company and furnished to the shipbuilder for installation in the ships. The initial indications of this problem were uncovered during an inspection, in September 1979, of one of the turbines on an SSN 688 Class submarine under construction at Electric Boat. Subsequent investigations by General Electric confirmed the problem. Specifically, cracks had developed in the rotating portions of the turbines. Investigations revealed that vibrations at high operating speeds caused fatigue cracks. New rotors incorporating required design changes were provided to Electric Boat for the Trident submarine in December 1979 and were installed by Electric Boat in January of 1980. For the SSN 688 Class submarines under construction at Electric Boat, those repairs necessary to permit safe operation were authorized. Other fixes were deferred to the first Post Shakedown Availability (PSA) following delivery. During this same period, the ship service turbine generators procured by the Navy from Westinghouse and furnished to the shipbuilder on the lead Trident submarine were discovered to be out of balance, resulting in structureborne noise levels in excess of allowable limits. This necessitated rebalancing of the turbine generator rotors.

For the Trident submarine *Ohio*, a ship delivery delay of approximately 60 days for the work required by the shipbuilder to correct these deficiencies was agreed to between the Navy and Electric Boat and a bilateral contract modification was executed. For SSN's 697-699 the contractor was directed to make only those interim modifications necessary for the ships to proceed to Post Shakedown Availability (PSA). During the respective PSA's for these ships, the Navy will complete all required modifications. The repairs made by the contractor were accomplished concurrent with correction of the non-conforming steel. The rotor repairs on each submarine were completed in approximately three to five weeks.

DRAWING REVISIONS

In general, design data and drawings necessary for the construction of naval ships are developed by a shipbuilder or a naval architectural firm under contract with the Navy. For Trident submarines, Electric Boat, under separate contracts, is both design contractor and shipbuilder. Under this arrangement, Electric Boat, the design contractor, provides Electric Boat, the shipbuilder, with detail drawings and other data necessary for construction of the Trident submarines. Approximately 10,600 construction drawings are required and have been issued. During the design and construction process of any complex warship the drawings are often revised to reflect such items as design and construction errors, Government authorized changes, inconsistencies between drawings, and administrative or editorial changes.

The process employed at Electric Boat to communicate information rapidly concerning design data revisions is the use of an Engineering Notice (EN), a multi-purpose design and construction document. The ENs are issued to all involved departments at Electric Boat, the follow yards (if any), and to the Navy. The information contained in these ENs is later incorporated into formal drawing revisions. To date, for Trident, approximately 25,000 revisions have been identified, for an average of less than 2.4 revisions per drawing. This average compares favorably to other classes of submarines and other ship types as indicated on Chart 2.

CHART 2.—Drawing revisions per drawing for various classes of ships

Class:	Drawing revisions/ Drawing
SSN 637	5
FFG 7, LHA and DD 963	4 to 7
Three classes of tankers designed by a private builder for commercial customers	2.9 to 4.2
SSBN 616 class (follow-shipbuilder)	6
SSN 688	5.2
SSBN 726	¹ 2.4

¹ Based on 25,000 drawing revisions identified as of February 1981.

Not all revisions require work by the shipbuilder. Drawing revisions are used for many purposes other than new work, such as, documentation of installations that do not conform to the original drawing requirements but which are considered satisfactory, reduction in the inspection or testing requirements specified on the drawings, changing of part numbers, and general administrative or editorial revisions. During calendar year 1980, about 40 percent of the ENs issued required no work by the shipbuilder. Of the ENs issued during this time period, the shipbuilder has requested an equitable adjustment to the contract price and delivery schedule in about 25 percent of the cases.

The negotiation and execution of bilateral contract modifications which reflect appropriate equitable adjustments has been a problem. For over a year, Electric Boat has included in its proposals costs associated with performance of the work ("hardcore" costs), but in many cases has reserved its rights to claim, in the future, delay, and the costs associated with the delay. The Navy has requested Electric Boat to submit fully priced proposals so that the contracts will contain a contract price and delivery schedule which reflect events to that date. For the most part submission of fully priced proposals have not occurred. Accordingly, the Navy has taken appropriate contractual actions, since bilateral agreements could not be reached, to assure timely accomplishment of mandatory work and minimize delay in delivery of *Ohio*. In addition, Navy representatives meet daily with the design contractor and the shipbuilder to review all ENs. The purpose of these reviews is to ensure that only those ENs covering mandatory work are issued and to effect prompt authorization for mandatory work.

DELIVERY SCHEDULES

Chart 3 shows the Trident submarine delivery schedules. On 28 August 1980, Electric Boat provided a revised delivery date of June 1981 for the lead ship, *Ohio*, SSBN 726. Dates for the follow ships were not changed from those provided by Electric Boat in February 1978. In a letter dated 3 October 1980, Electric Boat advised the Navy that because of events subsequent to August 1980 it could no longer deliver the ships in accordance with the previously provided schedules. No new delivery dates, however, were provided. The Navy has requested on several occasions that Electric Boat provide detailed Trident ship construction schedules. None have been provided. During the most recent meeting with Electric Boat officials on this matter, the Navy was informed that Trident schedules could not be provided.

CHART 3

ELECTRIC BOAT DIVISION—TRIDENT DELIVERY SCHEDULES

Ship	Original contract delivery date	Electric boat estimate, February 1978	Electric boat estimate, ¹ August 1980	Navy estimate
726	Apr. 30, 1979	November 1980	June 1981	December 1981.
727	Apr. 30, 1980	do	November 1981	September 1982.
728	Dec. 30, 1980	July 1982	July 1982	September 1983.
729	Aug. 31, 1981	March 1983	March 1983	May 1984.
730	Apr. 30, 1982	November 1983	November 1983	January 1985.
731	Dec. 31, 1982	July 1984	July 1984	September 1985.
732	Aug. 31, 1983	March 1985	March 1985	May 1986.
733	May 31, 1986			January 1987.

¹ Electric Boat advised the Navy in October 1980, that these dates are under review

In the absence of an Electric Boat assessment, the last column on this chart shows the Navy's assessment of the delivery dates for the Trident submarines and takes into consideration the present state of construction of each ship, correction of quality assurance problems, and construction time frames based on recent experience at Electric Boat. This assessment is based on the following assumptions: (1) applications of manpower by Electric Boat consistent with the strategic priority of the Trident program and (2) a reasonable increase in shipyard work force.

CHART 4

ELECTRIC BOAT DIVISION—SSN-688 CLASS DELIVERY SCHEDULES

Ship	Delivery dates			
	Public Law 85-804, Electric Boat, February 1978	Electric Boat, August 1980	Electric Boat, December 1980	Navy, December 1980
698	October 1979	December 1980	February 1981	February 1981.
699	February 1980	February 1981	April 1981	April 1981.
700	June 1980	April 1981	May 1981	June 1981.
701	October 1980	June 1981	September 1981	October 1981.
702	February 1981	July 1981	October 1981	February 1982.
703	June 1981	September 1981	November 1981	June 1982.
704	February 1982	February 1982		December 1982.
705	June 1982	June 1982		April 1983.
706	October 1982	October 1982		October 1983.
707	January 1983	January 1983		February 1984.
708	September 1983	September 1983		June 1984.
709	January 1984	January 1984		October 1984.
710	May 1984	May 1984		February 1985.
719		August 1984		June 1985.
720		March 1985		October 1985.

Chart 4 shows the SSN 688 Class submarine delivery schedules. Electric Boat has rescheduled the delivery of SSNs 698-703 twice since the Public Law 85-804 settlement in June 1978. These delays range from 16 months later than deliveries established in the settlement for SSN 698 to 5 months for SSN 703. Electric Boat maintains that the balance of the ships (SSN 704-710 and SSN 719-720) will deliver as scheduled. Based on the assumptions regarding the availability and the application of resources stated above, the Navy's assessment of the schedules are shown in the last column. Delays in all SSN 688 Class delivery dates are projected.

Relative to the present efforts at Electric Boat, the progress that has been made in the past year includes the delivery of the attack submarine *Bremerton* (SSN 698) and initial reactor criticality and dockside propulsion plant testing on the lead Trident submarine, *Ohio* (SSBN 726). Another attack submarine, *Jacksonville* (SSN 699), has completed initial sea trials and is nearing delivery. The test program on SSBN 726 is nearing completion and the ship is expected to go on initial sea trials this summer.

COST PERFORMANCE

The cost performance of each shipbuilder is affected by the schedule and quality performances discussed above.

Actual return costs provide a significant indicator and are now available for the first five SSN 688 Class submarines delivered by each of the shipbuilders. The average shipbuilding cost for each submarine was \$98 million at Newport News and \$148 million at Electric Boat.

Quality control and schedule problems have affected the costs to complete submarines at Electric Boat. At the time of the P.L. 85-804 settlement in June 1978, Electric Boat Division estimated that 120.9 million manhours would be required to construct the eighteen SSN 688 Class ships covered under agreement. Electric Boat Division's most recent manhour estimate has risen to 127 million manhours, an increase of 5 percent since 1978. The eight SSN 688 Class submarines now under construction at Newport News Shipbuilding are actually under-running the estimate of manhours on which the target price of the contract was based by 3.4 percent.

In the case of the Trident submarines, Electric Boat's estimates for the lead Trident have grown from 14.6 to 23 million manhours since contract award. The shipbuilder estimates for the remaining Tridents also have shown an increasing trend during the past year, but at a lesser rate. Even with these increases, Electric Boat projections of final cost do not reach the point where the contractor must assume 100 percent of additional costs.

INSURANCE

Since 1942, the Navy has acted as a self-insurer of builder's risk associated with the construction of new ships. The scope of the insurance coverage is stated in the insurance clauses of the contracts as the risks of loss or damage which a commercial underwriter would assume under the "Marine Builder's Risk (Navy Form-Syndicate)" policy. The type of loss or damage, which the Navy policy covers, must be caused by an event which is fortuitous, unexpected and accidental. The loss or damage must result from events which cannot be foreseen and that occur as a matter of chance, such as fire, explosion or accidental breakage. Examples of insurable events include damage to equipment caused by fires, or damage to an item dropped due to failure of a lifting sling. These are insurable events under the Navy policy. The Navy has maintained, however, that the insurance clause and the Builder's Risk policy do not cover delay and disruption costs incident to an insurance covered event or the costs to correct faulty workmanship or defective material. In other words, the insurance clause and Builder's Risk policy do not provide a mechanism for payment for contractor rework of the type normal in the performance of the contract.

In November 1979, the Navy was notified in writing by Electric Boat that the costs associated with correction of the non-conforming steel problem were considered within the insurance risks assumed by the Government under the insurance provisions of the applicable contracts. The Navy informed Electric Boat that it sees no basis for a claim under the insurance or any other provisions of the contract for the non-conforming steel problem. Similarly, in October 1980, the company informed the Navy of its position that the cost and delay associated with the correction of defective welding are risks assumed by the Navy under the insurance provisions. The Navy responded that any cost and delay consequences associated with the welding reinspection and repair programs are not assumed risks under the Builder's Risk insurance provisions. In February, in order to avoid a backlog of potential claims, the Navy requested Electric Boat to submit its schedule for claims submission or to withdraw its assertions of Navy liability. On 17 February 1981 Electric Boat advised the Navy that its reimbursement requests for the welding reinspection program for the SSN 698 would be submitted at the end of February or early March 1981, and that reimbursement requests for correction of the non-conforming paint problem would be submitted in June or July 1981. Due to ongoing company efforts to recover from its suppliers, no date was provided for submission of a reimbursement request for the non-conforming steel. The Navy Office of General Counsel has Electric Boat's assertions under study. It is considered that the Navy's position in this matter will prove to be the correct one.

DELAY AND COST

Although not all the information is in and although not all of Electric Boat's records are available, the quality assurance problems at Electric Boat significantly delayed both the SSN 688 and Trident programs. During this period of time, repairs to Government furnished equipment and changes originating with the design contractor contributed to a lesser extent to the total delay. To take the SSN 698 as an example, the cumulative delay to the ship and approximately sixteen months from the delivery date established in the Public Law 85-804 settlement. Later ships have been delayed somewhat less. While the ultimate costs associated with the quality assurance problems are not readily quantifiable, a Defense Contract Audit Agency (DCAA) review of costs recorded by Electric Boat through December 20, 1980 indicate charges, not including delay or disruption costs, of approximately \$2.8 million for the contractor's evaluation of the non-conforming steel problem, \$67 million for the defective weld problem, and \$1 million for the epoxy paint problem.

The Navy at this time has not established who is responsible for what portion of the delay and cost to the program. Until the complex contractual and factual

issues have been resolved, we will not be in a position to give a precise allocation of liability. However, the Navy has advised the contractor that responsibility and liability for quality control problems such as steel, welding and paint are with the contractor. It is Electric Boat's obligation to deliver a quality product which conforms to the specifications of the contract.

SUMMARY

In summary, serious quality control and assurance problems have been experienced at Electric Boat.

Electric Boat has proposed specific actions to upgrade their quality assurance programs. A period of time will be required before all of these changes are fully instituted. The Navy's monitoring of Electric Boat's quality assurance programs has been increased and steps have been taken to add quality assurance specialists to the Supervisor's staff.

The quality assurance problems have caused substantial delays in the delivery of submarines by Electric Boat and have been the primary cause of the delays experienced during the past eighteen months. Corrective action is still underway (welding problem) on those submarines not yet delivered, however, this has been factored into the delivery estimates on the preceding charts.

The Navy is actively working to assist Electric Boat in the resolution of outstanding problems. Additionally, daily meetings have been established with Electric Boat management and the Supervisor of Shipbuilding's office to provide a forum for the exchange of information and resolving of administrative log jams.

The delivery of submarines under construction at Electric Boat will depend to a large degree on the actions of Electric Boat management; on how they train and apply available management and labor resources; on the emphasis they place on such aspects of shipbuilding as quality assurance and the rapid identification and resolution of problems; and finally on their dedication to the timely delivery of quality submarines.

The Navy has made an extraordinary effort to provide for the earliest delivery of submarines by Electric Boat consistent with standards of quality necessary for nuclear submarines. The large amount of work at Electric Boat makes the potential for future delays and cost increases more likely than the expectation that these estimates will be improved.

Admiral CLARK. Rear Adm. Glenwood Clark, Director of Strategic Systems Project.

Senator WARNER. Well, gentlemen, I thank each of you and your supporters in the background for getting up early this morning and coming forward.

I am advised by my experts that we have put together thus far a good record. We will let this record remain open until 5 o'clock for the submission of questions.

In passing I would like to observe that I have always had the highest respect for those who qualified in the nuclear submarine area and you have carried on those traditions in an exemplary fashion this morning. Let's see if we can't do a little bit better as we go into this public arena and sell the necessity to make these improvements in this program, the missile as well as the Trident, the boat itself.

I must say I am concerned, Dr. Zeiberg, and I assure you it is not for any considerations with respect to my State and their participation through the shipyard in the submarine program, but I am most reluctant to see a third yard opened up at this time to alleviate the pressure on the Trident construction program. I will look at that one very carefully if that is the desire of the Department of Defense.

Thank you, gentlemen.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN W. WARNER

SUM CONCEPT

Senator WARNER. Sidney Drell has proposed that the United States deploy Minuteman or MX missiles from Small Underwater Missile Submarines (SUMS) each carrying two to four missiles and operating near the protection of our coasts. Both the Navy and DOD did a study of SUMS last year.

Admiral CARTER, what advantages and disadvantages of SUM did the Navy find in its study?

Admiral CARTER. The Navy SUM study concluded the concepts to be technically feasible and to have many of the advantages endemic to SLBM's: namely survivability, endurance, low environmental impact, and crises/arms control stability. Nevertheless the concept is, on balance, unattractive for a number of reasons. I have outlined a few samples below:

Initial deployment could not occur before the early 1990s.

Such a concept has no actual significant advantage over conventional design ballistic missile submarines such as Trident.

Small submersibles are unlikely to be any less expensive than MX in multiple shelter basing mode and considerably more expensive than Trident on a basis of cost per surviving reentry vehicle.

Considerable technical risks are involved in some propulsion systems.

Personnel manning problems and cost of manning are higher than other proposals.

Consideration of the above factors, and many others including military effectiveness, survivability, operating flexibility, and cost effectiveness has convinced us that the Trident SSBN program should be the top priority effort to modernize the Navy's contribution to the strategic nuclear deterrent.

Senator WARNER. Admiral CARTER and Admiral KELSO, how would you evaluate the SUM concept compared in cost effectiveness to the *Ohio* Class Trident submarines?

Admiral CARTER. Our studies indicate that, when considering R&D, procurement, and basing cost, the costs per surviving missile at sea for SUM is approximately twice that of a surviving Trident II missile deployed on a Trident submarine.

Admiral KELSO. A Navy sponsored study, "An Assessment of Small Submarines and Encapsulation of Ballistic Missiles," promulgated on May 20, 1980, examined a SUM-like concept. As a part of that assessment, a feasible SUM-like concept was compared with *Ohio* Class Trident submarines. The study found that a system of small submarines with encapsulated M-X missiles is not as cost effective as Trident submarines armed with Trident II (D-5) missiles. On a cost-per-missile-at-sea basis, the acquisition and 25-year life cycle costs for the baseline encapsulated missile submarine system are approximately \$295 million and \$475 million, respectively, assuming a 60 percent at-sea factor. The same costs for a equivalent force of 16 Trident submarines carrying Trident II missiles are approximately \$155 million and \$230 million respectively, assuming a 66 percent at-sea factor.

DOD SUM STUDY

Senator WARNER. Dr. Zeiberg, what did the DOD study of SUMs conclude?

Dr. ZEIBERG. The DOD study of SUM reached the following conclusions:

1. SUM is unlikely to be cheaper than M-X: considerable technical advances have to be invoked to make it comparable in cost to M-X (or Trident) type systems.

2. SUM is unlikely to be available before the 1990's.

3. SUM must operate in deep waters as a short range submarine with no apparent advantage over conventional design ballistic missile submarines such as Trident. Therefore, substituting SUM for M-X would represent abandonment of the Triad in favor of a Dyad of bombers and submarines.

Senator WARNER. Dr. Zeiberg, would you comment on the merits of SUMS as an alternative to M-X.

Dr. ZEIBERG. Studies of SUM by OSD and the Navy have indicated that the SUM system is feasible; however, it would be significantly more expensive than SUM advocates have stated, it would not be available until the 1990's, and it offers no apparent advantages over more conventional submarine based missile systems. The total cost of a SUM system is difficult to assess since such costs

critically depend on survivability and at-sea availability assumptions which cannot be defined, with any degree of accuracy, for a system which is strictly a paper concept. It does appear that such a system would be roughly equivalent in cost to an M-X system which would deliver the same number of reentry vehicles on target. Such conclusion, however, must be viewed with caution since SUM costs are based on optimistic assumptions of technological advances and cost-reduction extrapolations which might be achievable by the 1990's. SUM costs may therefore be low and the system could cost significantly more than a comparable land-based M-X force.

A realistic IOC for SUM would be in the early to mid 1990's. Such a schedule, by itself, would infer that SUM is not an alternative to M-X. In addition, deployment of SUM rather than a survivable land-based ICBM system would transform our strategic forces into a Dyad, with a new type of submarine, less capable than Trident, to complement the existing fleet. This action would dilute the flexibility and survivability hedges inherent in a Triad and eliminate the unique military capabilities provided by our land-based ICBM's. Based on the above, we have rejected SUM as an alternative to the M-X system.

SLCM ROLES

Senator WARNER. The Tomahawk sea-launched cruise missile (SLCM) program is many-faceted. SLCM's can be launched out of torpedo tubes, out of armored box launchers on surface ships and out of vertical launchers on both surface ships and submarines. They can have conventional or nuclear warheads or even some other payload. They can be designed to attack ships or land targets.

Admiral CARTER, could you describe for us the role SLCM plays in Navy plans for the future?

Admiral CARTER. SLCM, will provide additional capability to existing and planned platforms. It will enhance the Navy's capability to execute a variety of options within both the sea control and power projection functions using either nuclear or conventional warheads as appropriate and authorized by the NCA:

- a. Strike selected naval targets ashore and at sea to enhance sea control operations.
- b. Strike selected targets in contingencies such as third world crises involving Soviet intervention.
- c. Strike selected fixed targets in support of the land war.
- d. Strike quasi-fixed targets to disrupt enemy second and third echelon movement.
- e. Strike or hold at risk selected targets after a major theater exchange.

Senator WARNER. Admiral Kelso, could you describe for us how conventional and nuclear SLCMs fit in with the operations of our existing submarine force?

Admiral KELSO. The CNO has used the term "Force Multiplier" to describe the role of SLCM in attack submarines and surface combatants. The addition of nuclear and conventional land attack SLCMs has the effect of adding a significant and entirely new offensive mission capability—that of strike warfare—to attack submarines. In order to insure that this capability is in addition to, rather than at the expense of, existing SSN missions, SLCM weapon loading will normally be constrained to preclude degradation in the ships' Anti-Submarine and Anti-Surface Warfare missions. The conventional anti-ship variant of Tomahawk, of course, will dramatically improve the SSN's ability to strike enemy surface ships, particularly including major combatants such as carriers and *Kirov* class cruisers, from long ranges. Congressional approval of the 688 class Vertical Launching System will result in an important increase in both the breadth and depth of each submarine's weapon load with no decrease in platform operational performance. Although SLCMs will clearly enhance the offensive effectiveness of ships so equipped, it is not intended that the ship's primary mission of ASW will change.

HYDRA LAUNCH

Senator WARNER. Last year the co-called "Hydra" launch technique for ballistic missile was highly publicized. Typically, Hydra launch involves lowering missiles into the ocean or a lake and firing them while they are floating point up. This concept was tested with sounding rockets in the late Sixties and early Seventies.

Advocates would have ICBMs hidden on board merchant vessels and drop them into the ocean.

Admiral Carter, has the Navy done any recent work on Hydra Launch?

Admiral CARTER. The Navy has reexamined this concept several times since the original Hydra work; most recently within the past six months. The primary advantage of this launch technique is that it gives the launch platform the capability to launch its missiles and leave the area before the missiles begin powered flight. [(Deleted)]

Other important factors such as costs, technological risks, physical security, and command and control problems, when balanced against the cited advantage have led the Navy to conclude that the Hydra concept is not attractive at this time.

Senator WARNER. Admiral Carter, what are the advantages and disadvantages of launching ICBMs off merchant ships using the Hydra concept?

Admiral CARTER. We are working with the Office of the Secretary of Defense on a study which will examine the question of launching ICBMs from surface ships. At first glance, it appears to us that ICBM's could be modified, either to be launched from tubes or launchers on ships, or from the water after having been placed there by specially configured ships. This latter possibility would draw on the Hydra concept. We hope to complete our study this spring. For the present I would not wish to prejudge the results of our ongoing review.

BALLISTIC MISSILE SURFACE SHIPS

Senator WARNER. Admiral Carter, how survivable would surface ships carrying ICBMs be in the 1990s, especially taking into account modern surveillance technologies of the 90s?

Admiral CARTER. We are working with the Office of the Secretary of Defense on a study which will assess the question of launching ICBMs from surface ships. That study will of course address the vulnerability issue. It would be premature to attempt to address vulnerability a decade hence before we have an opportunity to explore the subject in depth. We anticipate completion of our study this spring.

SLBM'S WITH HYDRA LAUNCH

Senator WARNER. Admiral Carter or Admiral Kelso, why did the Navy not deploy SLBMs with Hydra launch in the late 1950's and early 1960's?

Admiral CARTER. The Hydra launch concept, which includes some form of flotation device or encapsulation of missiles, was considered along with the bare launch concept (bare missile stored in dry missile tube prior to launch). In developing the Polaris/Poseidon system, such factors as cost, reliability, technological risk, payload as a function of volume, threat, command and control aspects, and operation considerations were examined in detail. Based on these factors the Navy decided that the bare launch concept was the preferred choice by a wide margin.

Senator WARNER. Dr. Zeiberg, what is the Defense Department's evaluation of Hydra launch as a substitute for M-X or submarines with missiles?

Dr. ZEIBERG. We are proceeding with a vigorous and thorough review of M-X basing options and will make a final decision by June 1. The Department of Defense evaluation of options such as Hydra, as a substitute for M-X, must await completion of this review. I see no benefits in considering the Hydra as a substitute for our current and planned sea-based strategic systems. I feel that Hydra has significant problems in areas such as platform/missile survivability, command and control, missile accuracy, security, and safety relative to our SSBN force and therefore does not compete as a substitute for our survivable Poseidon/Trident systems.

SLCM PROCUREMENT

Senator WARNER. Procurement funding for Tomahawk SLCMs is less in 1982 than for fiscal year 1981. Procurement levels are far below those anticipated only last year.

Admiral Carter, why has procurement of SLCMs been cut back?

Admiral CARTER. Although the Navy's procurement requests for Tomahawk have been constrained by affordability considerations, they have not been cut

back. In Fiscal Year 1980 the Administration requested some long lead production money and Congress authorized the first six tactical missiles. In Fiscal Year 1981 the Administration requested 20 missiles and Congress appropriated funds for 50. The Fiscal Year 1982 budget submission called for 48 missiles as provided for in the FYDP. The new Administration has amended that number to 88. The number of SLCMs requested by DOD has steadily grown, and in each case the Congress has responded with authorizations larger than the budget requests.

SLCM FORCE LEVELS

Senator WARNER. Admiral Carter, what is the Navy's official requirement for SLCMs, and are higher requirement levels under study?

Admiral CARTER. The current "best guess" SLCM requirement is 4,000-5,000 missiles that would be capable of being mated to either conventional or nuclear warheads. Higher requirements are under study and the final total depends upon many variables; what and how many platforms will carry SLCM; how many SLCMs will each platform carry; what will the ultimate mix of the SLCM variants be? SLCM is being deployed in a target rich environment which could support more than can probably be feasibly procured.

SLCM PRODUCTION

Senator WARNER. I understand that Admiral Locke, from the Joint Cruise Missile Office is here today. Admiral Locke, are there any technical or industrial feasibility reasons why SLCM production could not be continued at the rates originally planned?

Admiral LOCKE. SLCM production can be continued at rates originally planned. In fact, the technical and industrial capacity supports a program acceleration.

Cruise missile production capacity is currently five (5) missiles per month limited by machine tooling. The 1981 production contract increases that capability to 15 missiles per month with the limitation being tooling, test equipment, fuel and paint facilities. A 60 per month capability is available given a 36 month rate acceleration plan lead time. General Dynamics facilities support a 120 per month capability with a second source contributing an additional 20 per month beginning in Calendar Year 1984.

IOC SCHEDULE

Senator WARNER. Admiral Locke, what is the IOC for each type of SLCM, submarine or ship launched, conventional or nuclear, anti-ship and land attack?

Admiral LOCKE. The following is the IOC schedule for the sea-launched cruise missile variants:

IOC	Sub	Ship	Air
Land attack nuclear Tomahawk (BGM-109A).....	June 1984.....	June 1984.....	
Antiship Tomahawk (BGM-109B).....	June 1982.....	June 1983.....	
Land attack conventional Tomahawk (BGM-109C).....	January 1982.....	do.....	
Tomahawk air launched cruise missile (AGM-109C).....			December 1982; ¹
Tomahawk air launched cruise missile (AGM-109I).....			April 1985.

¹ Earliest.

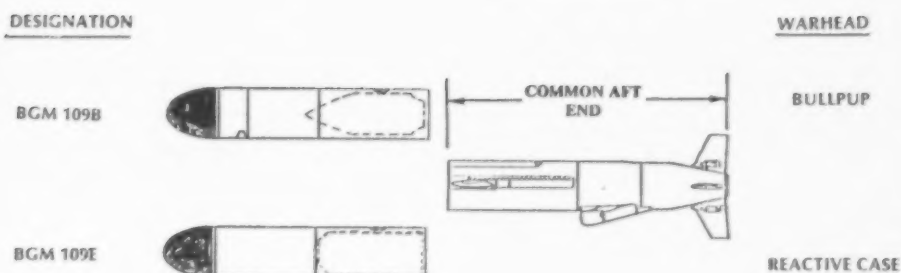
SLCM MIX

Senator WARNER. Admiral Locke, how does each model of SLMC differ physically, and how late in the program is it possible to alter the mix of SLCM production?

Admiral LOCKE. Dimensionally all SLCM missiles are identical. They share a common aft-end (mid-body, aft-body and tailcone sections) and engine. Land attack SLCMs (BGM-109 A & C) use the same inertial navigation system with the conventional variant (BGM-109C) adding an optical digital scene matching correlator for improved terminal accuracy. The anti-ship SLCM (BGM-109B) uses an active radar terminal seeker and attitude reference assembly guidance set. (See Fig. (1) and Fig. (2) for commonality reference.)

The contractor would require a minimum of 16 days notification to change the configuration prior to final missile delivery. To allow for this flexibility, line banking of the various front end configurations is necessary.

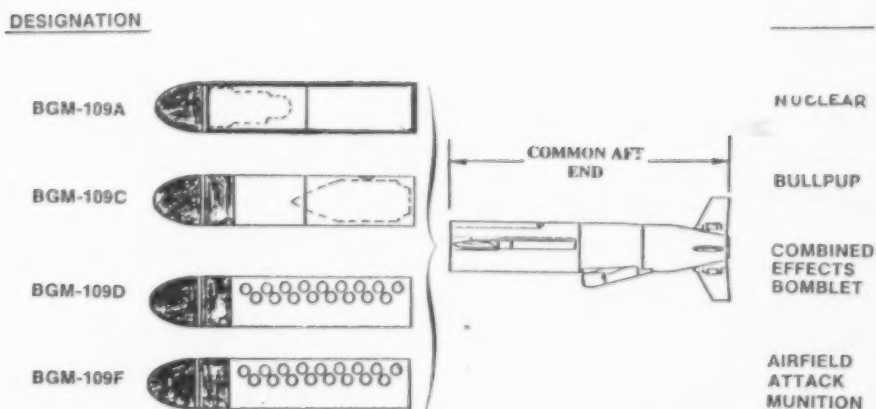
SUBMARINE AND SURFACE SHIP LAUNCHED ANTI-SHIP CRUISE MISSILES



- MISSILES USE SAME TURBOFAN ENGINE FOR SUSTAINED PROPULSION
- MISSILES USE SAME ACTIVE RADAR TERMINAL SEEKER AND MIDCOURSE GUIDANCE UNIT.

FIGURE 1

SUBMARINE AND SURFACE SHIP LAUNCHED LAND ATTACK CRUISE MISSILES



- ALL MISSILES USE SAME TURBOFAN ENGINE FOR SUSTAINED PROPULSION
- ALL MISSILES USE SAME INERTIAL NAV SYSTEM WITH ENROUTE UPDATES BY TERRAIN CONTOUR MATCHING
- CONVENTIONAL WARHEAD VERSIONS (C/D/F) ADD TERMINAL AREA OPTICAL SCENE MATCHING FOR IMPROVED ACCURACY

FIGURE 2

FISCAL YEAR 1982 SLCM MIX

Senator WARNER. Admiral Locke, what is the mix of SLCM's planned for fiscal year 1982?

Admiral LOCKE. Sea launched cruise missiles planned for fiscal year 1982 are as follows:

	Fiscal year 1982	Fiscal year 1982 (amendment)
Anti-ship Tomahawk (BGM-109B).....	15	30
Land attack conventional Tomahawk (BGM-109C).....	33	58
Total.....	48	88

The split of anti-ship and conventional land attack (BGM-109 B's to C's) for the fiscal year 1982 Amendment is based on the same ratio (approximately 60.43 percent) as the previous fiscal year 1982 split. However; no official desired split has been determined by the Navy at this time.

Senator WARNER. Admiral Locke, what was the mix of SLCMs planned last year for fiscal year 1982?

Admiral LOCKE. Last year's sea launched cruise missiles planned for fiscal year 1982 was as follows:

	Fiscal year 1982
Antiship Tomahawk (BGM-109B).....	24
Land attack conventional Tomahawk (BGM-109C).....	24
Total.....	48

REDUNDANCY/HEDGING

Senator WARNER. Admiral Carter, in your statement you say "the redundancy in our mix of strategic forces provides a hedge against a sudden change in the balance, providing too much of an important force characteristic such as time urgent, hard target kill capability is not concentrated on one system." Lest there be any misunderstanding of those remarks, would you clarify their meaning?

Admiral CARTER. To provide an adequate, effective hedge, the force element must not only be effective against the target system—that is the yield, accuracy and reliability of the system must be adequate—but it should also be survivable. One of the capabilities that the Secretary of Defense has called for, and one which is implicit in a countervailing strategy, is the ability to attack time urgent hard targets such as enemy missile silos and command and control centers. Today our time urgent capability resides in our ICBM and SLBM forces, but the time urgent and hard target kill capability resides only in our ICBM force. Thus to adequately hedge our capability, the US should, in my view, deploy a more accurate missile, and one capable of carrying a higher yield warhead in our survivable SLBM force. This would provide the most survivable and endurable leg of the Triad with a meaningful capability for time urgent destruction across the entire spectrum of high value Soviet targets.

STRATEGIC FORCE MIX

Senator WARNER. While it is clear that you feel it is essential for the sea-based leg of the Triad to have prompt hard-target capability, is it not correct to interpret your remarks as making the case against placing all the United States' time-urgent counterforce capability in either the sea-based or the land-based deterrent?

Admiral CARTER. That is correct, because I am convinced redundancy and hedging are essential characteristics. It is also important that these forces be survivable and not present tempting targets for the Soviets thereby providing incentives for the Soviets to proliferate. A decision on the proper mix of strategic forces should evaluate these factors and the others I discussed in my presentation.

Senator WARNER. Do you regard the survivable basing of a modern land-based ICBM as being "excess to (our) military needs" and do you think the MX is being produced simply "in order to compensate for system vulnerabilities" or do you think that the very redundancy in our mix of strategic forces to which you refer in your opening statement requires the modernization of our ICBM force with a survivably-based MX?

Admiral CARTER. I think the latter. As I pointed out in my statement, there are many desirable attributes the several strategic systems should possess and redundancy is an important one. Costs, survivability, environmental impact, damage limiting capability, targeting effectiveness, and impact on Soviet incentives to further proliferate their weapons are some of the other factors that must be considered. The decision maker must assess these and weigh their relative importance in arriving at a judgement on the proper mix of strategic forces.

TRIDENT SUBMARINE PROGRAM

Senator WARNER. The lead Trident submarine, SSBN 726, has been delayed from a November 1980 delivery to February 1981, and most recently to July 1981. Press accounts have suggested that even that schedule is no longer valid. What is the currently planned delivery date for the SSBN 726?

Admiral KELSO. The Navy has requested on several occasions, the last time on 7 January 1981, that Electric Boat provide detailed Trident ship construction schedules including a current estimated delivery date. Electric Boat has not provided the requested information to date. The Navy estimates *Ohio* delivery late in 1981.

Senator WARNER. Why has no new date been established?

Admiral KELSO. The Navy does not know why new delivery dates for all Tridents have not been provided by Electric Boat. Numerous attempts have been made by the Navy to obtain the dates including a request made to the Chairman of the Board of General Dynamics Corporation.

Senator WARNER. What is the critical path leading to completion of the SSBN-726? Why has no critical path been provided to the Navy? What are the implications for resolutions of engineering notices and other problems of operating without an established critical path?

Admiral KELSO. The Navy has repeatedly requested that Electric Boat provide detailed Trident ship construction schedules so that an analysis of the critical path to delivery could be accomplished. No detailed schedule has been provided. At this stage of construction, the controlling paths to delivery are: Completion of trade work; completion of system testing, various surveys and habitability inspections, system/component operational control transfer to Navy crew members; dock trials and sea trials.

The Navy is authorizing only that work required by those engineering notices which are mandatory prior to delivery. Without detailed schedules from Electric Boat, the Navy must make its own assessment of the schedule impact of engineering notices.

Senator WARNER. Have steps been taken with regard to Trident contracts to ensure that quality assurance problems such as those encountered heretofore are not going to recur? Does this represent a change in the quality requirements for the Trident submarines?

Admiral KELSO. In late October 1980, Electric Boat generally agreed to changes that the Navy considered necessary to bring their quality program into full compliance with government requirements. Major quality program changes included: (1) an additional audit program for work completion; (2) use of departmental overview audits; (3) additional attention to effective audits, data analysis and corrective action feedback; (4) use of process, defect and variance analysis; (5) additional resources to increase the frequency of surveys of the quality programs of rated vendors, and (6) restructuring and expansion of quality audit activities. A revised "Quality Program Management Plan" incorporating these changes was also developed and provided to the Navy. NAVSEA reviewed Electric Boat's revised program and in November 1980 notified Electric Boat that their plan was acceptable.

The fiscal year 1980 Trident submarine contract with Electric Boat incorporates this revised Quality Program Plan. This contract also provides for periodic audits by the Government of the contractor's Quality Program for compliance with Government requirements and quarterly Quality Program management meetings between the contractor and the Government. Although this action represents changes to the quality assurance program, it does not represent a change in the quality requirements for the Trident submarines.

Senator WARNER. Please amplify on testimony concerning alternatives to reliance on Electric Boat for sole source Trident production which should be considered—introduction of a public or a second private shipyard into Trident construction, redistribution of 688 construction from Electric Boat to Newport

News, planning for a simpler, less sophisticated follow-on design, etc? What would be the cost or other constraints involved in adopting such alternatives.

Admiral KELSO. Electric Boat Division is the only builder of Trident submarines. The construction contract for *Ohio* (SSBN 726), the lead Trident ship, was awarded in 1974 after competition between Electric Boat and Newport News Shipbuilding and Drydock Company. Since the award of the lead Trident to Electric Boat, Newport News has not bid on the construction of any follow Tridents. However, they could, with facilities improvements and the necessary corporate commitment, construct Trident submarines.

Recent reviews of naval shipyard capabilities indicate that Mare Island and Puget Sound Naval Shipyards have potential to support Trident submarine construction.

Newport News and Navy yards would require significant increases in employment levels, extensive long term shipyard facilities modernization programs and adjustments in planned major overhaul programs to accommodate Trident production. Present projected Trident procurement rates do not substantiate the need for a second Trident shipbuilder. It is doubtful, at these procurement rates, that the additional investment required to bring a second builder on line could be amortized over the remaining ships of the class without increased overall program costs.

Over the past several years a variety of analyses and studies have been conducted to explore alternatives for the Trident submarine. No cost effective alternative to the Trident submarine emerged from these studies, consequently no effort toward a new design is underway at this time.

While the Navy currently has no plans to redistribute SSN 688 class submarines already under contract it is considering additional shipyards for future SSN 688 class construction efforts.

INSURANCE CLAIMS

Senator WARNER. Is it the Navy's understanding that Electric Boat intends to file insurance claims against the Navy (as the insurance carrier for private shipyards engaged in naval construction) for costs incurred due to delays caused by defective workmanship and material and mismanagement? Is it possible that losses arising from Electric Boat's settlement with Navy under Public Law 85-804 may be submitted as insurance claims?

Admiral KELSO. In February 1981, Electric Boat informed the Navy that its "reimbursement requests" for the welding reinspection program for the SSN 698 would be submitted at the end of February or early March 1981, that "reimbursement requests" for correction of the paint problem would be submitted in June or July 1981, and that "reimbursement requests" for other ships would be submitted "for each individual ship as the program for that ship is completed . . ." No date was provided for the submission of a "reimbursement request" for the nonconforming steel. No claim has been received to date.

In the Public Law 85-804 settlement modification, the contractor reserved its rights under the insurance clause of the contract, except for costs associated with loss or damage as to which the Contracting Officer gave direction for replacement or repair prior to 9 June 1978. Electric Boat's intention with regard to submission of insurance claims other than those mentioned previously is unclear. It is not possible to comment on the nature of any insurance claims until the Navy has had an opportunity to review such claims if and when submitted.

Senator WARNER. What would be the anticipated consequences for the Navy in its dealings with its other contractors of such a claim being brought forward and adjudicated against the Navy?

Admiral KELSO. Other shipbuilding contracts contain the same insurance provisions as those in the contracts with Electric Boat. It is possible that other contracts would seek reimbursement for defective workmanship or material if Electric Boat is successful in its claim.

Senator WARNER. Does the Navy intend to continue to act as insurer for shipyards engaged in naval construction?

Admiral KELSO. The Navy intends to continue to provide builder's risk insurance coverage under naval new construction contracts as has been done since 1942.

Senator WARNER. What role does SUPSHIP Groton play in supervising the day-to-day construction of the Trident submarines? Does the Supervisor and his

subordinates have the responsibility for inspection and management of Electric Boat activities with regard to *Ohio* Class construction? Is EB adequately performing its inspection and management responsibilities under the terms of the 726 and follow-on contracts?

Admiral KELSO. SUPSHIP Groton's responsibility is to oversee and administer Trident construction and other contracts at Electric Boat Division. SUPSHIP does not supervise the day-to-day construction of submarines but does monitor operations on a frequent basis. SUPSHIP responds to actions the contractor takes through review of technical, cost and schedule data which is prepared and submitted by the contractor under the terms of the contracts. The SUPSHIP is responsible for assuring that applicable data conforms to contract requirements, or when such data or contractor actions differ from contract requirements, that the course of action proposed by the contractor is in the best interests of the Government and does not degrade the safety, mission or capability of the ships. In addition, SUPSHIP Groton often assists the contractor in timely and effectively resolution of design and construction problems, and ensures the availability and operability of Government furnished material.

The responsibility for inspection of work is assigned to the Electric Boat Division under the terms of current contracts. Management, including the planning, staffing and execution of the company's activities is the responsibility of Electric Boat Division personnel. The Supervisor and his subordinates have the responsibility to assure that the contractors' inspection system is effective and efficient, and that the product meets contract requirements. To meet these responsibilities, the Supervisor's office, as appropriate, may physically inspect work on the submarine or other indicators of performance.

EBDIV has agreed under the terms and conditions of the Trident contracts to establish a quality program in accordance with a Military Specification which requires in part the following:

- a. Clearly defined and effective quality management.
- b. Quality planning.
- c. Clear and complete drawings and work instructions.
- d. Complete and reliable records and data.
- e. Provisions for the detection and correction of conditions adverse to quality.
- f. Assurance that all provided supplies, services, materials and manufacturing processes conform to the contract requirements.

EBDIV has experienced quality problems such as the use of steel and paint which does not conform to the contract specifications and the performance of incomplete and unsatisfactory structural welding. In April 1980, EBDIV has requested to conduct an in-depth review of their quality program. In June 1980, NAVSEA conducted a pre-award survey of EBDIV's quality program which identified quality program management, purchase control and manufacturing processes as weaknesses. NAVSEA concluded that there was not adequate implementation and execution of quality requirements.

Review of EBDIV's corrective actions indicates some progress in an upgrade of their quality program.

Senator WARNER. How many Trident submarines are presently planned for procurement? What is the optimal building rate of obtaining a force of that size in view of shipbuilding yard and support facility construction rates?

Admiral KELSO. The ultimate Trident force level has not been determined. The 5-Year Defense Plan through 1986 provides for construction of 15 Trident submarines. The planned rate is one ship per year 1981-86 except for two ships in 1985.

Senator WARNER. What effect is the slippage currently being experienced in the construction of SSBN 726 expected to have on delivery dates of follow on ships? Is the Navy continuing to strive for identical copies of the lead ship in the follow on vessels? What impact would prototyping the SSBN 726 have on operation and support characteristics of the total Trident force?

Admiral KELSO. The delay in delivery of the SSBN 726 will adversely affect the deliveries of all follow-on Trident ships. It is the Navy's estimate that the delivery of all follow-on Trident ships. It is the Navy's estimate that the delivery dates for the follow-on Tridents will slip 8 to 14 months each. The Navy is continuing to strive for standardization of Trident submarines since an important program objective is the facilitization of maintenance and logistics support, increased time on station and simplification of Navy crew training.

Departures from the standard class design in the lead ship would have negative effects on supply support, training and early verification of the ship design through at-sea experience.

Senator WARNER. Why has the Navy concluded that three Tridents every 2 years is an unsatisfactory or unobtainable building rate? Have production streamlining steps such as the VEVEY facility undertaken by Electric Boat failed to result in the anticipated savings in manhours and the improved production efficiency? Does the Navy expect to see significant improvement in these areas in the futures?

Admiral KELSO. The Trident building rate was established by the Secretary of Defense. It is too early to determine the extent of any savings resulting from the use of production streamlining facilities or processes that Electric Boat has recently adopted.

NAVY CONNECTIVITY STUDY STATUS

Senator WARNER. What steps have been taken by the Navy to implement the recommendations of the CNO's connectivity study with regard to survivable and enduring C³?

Captain DONOVAN. The CNO's Strategic Connectivity Study comprises investigation of an array of areas of technology which might serve to establish, restore or extend connectivity. It is structured in three phases. Phase I, a subjective examination of connectivity and procedures, has been completed and resulted in 22 recommendations to the Joint Chiefs of Staff. Phase II, a quantitative assessment, is in progress and scheduled to be reported in the spring of 1982. Phase III, a continuing effort, will be initiated upon the completion of Phase II and will be an annual assessment of progress toward system goals and an evaluation of the continued suitability of the goals.

The recommendations to the JCS in the form of actions required in the near term, actions requiring further study, and proposed actions not considered appropriate for further pursuit. The recommendations of Phase I of the Connectivity Study were limited by policy direction to procedural changes or use of existing off-the-shelf hardware for near-term corrective actions. Eleven of the recommendations have been implemented and another six are progressing toward resolution and three are being coordinated within the Department of Defense. Two recommendations have been found to be impracticable for implementation at this time but are being considered for inclusion in longer term future actions.

Concurrent with implementations of the explicit recommendations of Phase I of the Connectivity Study, Navy has reviewed and restructured its Strategic Communications Research and Development program, combining the previous programs of Gryphon and Hydrus into a single, integrated effort identified as Navy Strategic Communications.

NAVY STRATEGIC COMMUNICATIONS R. & D. PROGRAM

The Navy Strategic Communications R. & D. Program is structured to address and implement the recommendations of the Study. It addresses elements of the Connectivity Study recommendations which are ready for development now as well as funding needed to correct operational deficiencies in existing systems. The baseline also provides funds for continuing assessment of current connectivity performance.

The Navy Strategic Communications R. & D. Program funds engineering development and procurement of functional replacement elements of existing systems to improve reliability and maintainability of those units. [Deleted.]

These have virtually no technical risk and are needed to ensure continued operability and availability of current capabilities in the current decade. This increment also continues investigation, under the Navy Strategic Connectivity study, of the feasibility and technical risks of various suggested contributors to the Survivable and Enduring Communications, [deleted]. The latter are not all ready for near term development, but rather require further analysis to identify the technical and fiscal constraints which must be overcome before such systems can be fielded.

It also provides essential initial funding for advanced and engineering development of survivable and enduring communications systems [deleted]. These techniques are of relatively low technical risk, and are capable of an initial operational capability [deleted]. These and other elements, which are addressed in

response to the next question, bring into being those suggested systems which would provide secure and enduring connectivity [deleted].

Senator WARNER. What additional steps beyond those currently programmed are needed to implement fully those recommendations? What are the costs of these steps and in what order of priority, absent funding constraints, would they receive attention?

Captain DONOVAN. Beyond the current funding are a number of initiatives addressing near and far term capabilities. Their prioritization necessarily depends on the rapidity with which secure, redundant and enduring connectivity can be established.

The highest priority for establishing a trans-attack and post-attack reconstitutable capability is the replacement of the current TACAMO EC-130 force with a modern EMP-hardened [deleted] aircraft (ECX). The next highest priority must be the implementation of the ELF recommendation presented to the Congress 4 March 1981 by submission of the FY-82 budget amendment. This is followed immediately in priority by the need for an operational EHF satellite communication system. This system with its capability for highly jam resistant [deleted] communications serving a broad spectrum of strategic and tactical forces will provide secure [deleted] report back communications from our strategic submarines. Beyond these three immediately executable programs, the highest priority is to implement the program for providing the strategic high frequency communications capability with the Adaptive EF project coupled with the redundancy achieved with applications of meteor burst technology. This is followed by the need to support necessary R&D to examine concepts recommended by the Navy Strategic Connectivity Study, Phase II and the fact-of-life requirements to sustain the strategic communications support provided by UHF satellites. All of these projects apply known and established technology to achieve effective connectivity of pre-attack deterrence, trans-attack continuity and post-attack reconstitution.

The cost of these programs for the next fiscal year are:

Unconstrained fiscal year 1982 funding requirements

	<i>Millions</i>
ECX -----	\$57
ELF -----	35
EHF -----	17
Other survivable and enduring communications-----	25
Long-lead procurement for FLTSAT (UHF satellite continuation)-----	23

PROJECT ELF CURRENT STATUS

Senator WARNER. Where do we stand on the Presidential decision on Extrême Low Frequency (ELF) required by law by April 1, 1981? Has there been any indication on Secretary Weinberger's part, or on the part of the President, as to their respective attitudes on this issue?

Captain DONOVAN. The Defense Authorization Act of fiscal year 1981 directed that Navy resume research and development on ELF and required that an implementation plan for an operational ELF program be provided to the Congress by April 1, 1981. It is anticipated that the President will review the ELF program before April 1, 1981.

NEED FOR ELF

Senator WARNER. In the face of the growing requirement for enduring C³, why does the Navy continue to seek a soft and non-enduring system like ELF?

Admiral CARTER. To appreciate the need for a soft, non-enduring system like the ELF one must understand the nature of anti-submarine warfare (ASW) and the potential threat facing our SSBNs.

Most importantly, ASW is a war of attrition. It takes time—days, weeks or months—to seek out, detect, localize and finally kill submarines. Detection is the first step and during normal day to day peacetime operation the Soviets are undoubtedly attempting to gain intermittent detections on our SSBN's. If successful in this, over a prolonged time they could begin to piece together a mosaic which could narrow the uncertainty of location of the SSBNs. This could result in a relatively small ocean area the Soviets would have to search out in order to localize the SSBN before attack—not the 20 million or so square miles the sub-

marines might operate in. Thus peacetime detection would enhance the Soviet capabilities to mount a surge attack and threaten a significant portion of our SSBN force over a relatively short time. Another important scenario is the conventional, non-nuclear war which could well extend over a lengthy period. Given a detection capability, the Soviets might be able to slowly attrite our SSBN force over time. If this became severe, our retaliatory capability would be degraded and pressure to resort to nuclear war would be increased—the use or lose dilemma.

Thus, it is felt that the periods of greatest concern are normal day to day operations or a prolonged conventional war; periods in which time is on the side of the Soviets.

Our ballistic missile submarines [deleted] are required to remain in continuous communications with the National Command Authorities in order to be responsive to execution orders. To do so with existing communications systems, the SSBNs must either trail a small antenna on the surface, tow a buoy with an antenna slightly below the surface, or operate at or very near periscope depth. Although we do not feel that our submarines operating in these modes are detectable today, advances in technology could make this so in the future. ELF which permits operation at much deeper depths and at higher speeds will break this umbilical to the surface, significantly enhance the operational flexibility of the submarine and eliminate the possibility of intermittent detection of submarine antennas.

[Deleted.] TACAMO is the system we rely on today to provide us a survivable assured link to the submarines. If the SSBN has been successful in remaining covert in his operations up to this point, exposure of an antenna for a relatively short period of time to receive emergency traffic will not present any threat to the submarine.

ELF is a system designed to complement existing systems; one that gets the submarine and its antennas away from the near surface to insure continued covertness and invulnerability into the future. In this sense it is similar to the significant efforts that have gone into the acoustic quieting program and into long range missiles; all designed to stay ahead of the threat.

Captain DONOVAN. The ELF system is one of several elements of a strategic communications system. No one element can provide the total degree of hardness, redundancy and reconstitutability essential for pre-, trans- and post-attack command and control of strategic forces. ELF will provide a unique, and currently unavailable, capability to communicate to our submarines at operational depths and speeds without the constraints of near-surface antennas. This will contribute to sustaining the survivability of the submarine forces by reducing the potential for their detection. The ELF system, which will not be hardened against nuclear attack, is highly jam-resistant and will be particularly useful in conventional warfare, during crisis, throughout the spectrum of limited nuclear operations and in a nuclear or non-nuclear war at sea.

Senator WARNER. Have the prospects for surmounting the technological challenges involved in alternatives to ELF (such as the Blue-Green laser concept) appreciably diminished over the past year so as to allow a near-to-medium term deployment of an alternative system which would obviate the need for ELF?

Captain DONOVAN. No.

Candidate alternatives to ELF examined include:

- Ultra Low Frequency.
- Lithospheric Waveguides.
- Acoustic Systems.
- ELF Satellites.
- Airborne ELF.
- Balloon ELF.
- Rotating Super-Conducting Magnets.
- Superimposition of ELF on powerlines.
- Pico-second pulse technology.

None of these has progressed beyond exploratory development, most are on the leading edge of technology and all have imposing technical deficiencies whose resolution have not yet been established.

With respect to blue-green lasers, even with the progress of recent years, through research sponsored by the Navy and more recently by the Defense Advanced Research Projects Agency, the following are still cogent:

- High technical risk.
- High system cost.

Significant technological breakthroughs are required to improve transmitter power, energy and efficiency.

Development of practical, narrowhead, wide-field-of-view optical filters is required for receivers.

Considerable uncertainties exist regarding the variations of laser light losses in ocean water, as well as the effects of clouds and carrying light conditions.

Successful development and deployment is not likely before the early 2000s.

Blue-green laser technology is one of the prospects under investigation by the Strategic Connectivity Study in Phase II. Phase II is in progress now, and its results will be reported in the spring of 1982. Additionally, a Defense Science Board Task Force of objective scientists and engineers has made an independent assessment of the status and prospects of blue-green laser technology. Their findings confirm that although blue-green laser technology may hold some promise for future communications, it is not available as an alternative to ELF, whose technology is known, established and implementable in the near term.

TACAMO LIMITATIONS

Senator WARNER. What are the operational constraints on the present TACAMO force? [Deleted.]

Captain DONOVAN. EC-130 operational constraints. The EC-130/Hercules airframe has matured [deleted].

TACAMO/SSBN connectivity limitations. The limited number of TACAMO assets impacts unfavorably on force connectivity. [Deleted.]

EC-130 TACAMO GROWTH POTENTIAL

Senator WARNER. What growth potential exists for further upgrading and improving the capabilities of the EC-130 TACAMO force? Will we pay a [deleted] penalty [deleted] which may result in reduced operational capabilities?

Captain DONOVAN. *Growth Potential.* Addressing the aspects [deleted] there is no growth potential in the EC-130. [Deleted.]

URGENCY FOR ECX TACAMO

Senator WARNER. How high a priority does the Navy attach among its connectivity programs to the replacement of the TACAMO aircraft?

Captain DONOVAN. The Navy attaches a very high priority to the procurement of this significant strategic enhancement and is currently considering the ECX replacement [deleted].

ECX FUNDING

Senator WARNER. What funds are being sought in the fiscal year 1982 program with such a replacement program?

Captain DONOVAN. There are currently no funds in the fiscal year 1982 program for ECX.

ECX TACAMO FUNDING NEEDS

Senator WARNER. What additional funds are needed to allow an orderly TACAMO replacement program to get underway?

Captain DONOVAN. \$25M would fund ECX RDT&E for fiscal year 1982. There is also a need to procure two USC-13 TACAMO Communications Suites (APN-\$36.4M). The suites would prevent the early termination of operational EC-130s in order to have their communications suites available for installation in ECX.

TACAMO MODERNIZATION

Senator WARNER. What are the costs—in dollars and operational performance—of failing to modernize the TACAMO fleet in a timely manner?

Captain DONOVAN. Dollar costs for continuing with the EC-130: If a follow-on aircraft to the EC-130 is not procured soon, the Navy will invest \$309.9 million from FY82 through FY86 for nine replacement C-130 airframes and associated spare parts. An additional \$75 million in the same years to [deleted] the nine. An additional \$81.4 million would be required in Fiscal Year 1983 and Fiscal Year 1984 for the purchase of four communications suites to preclude early termination of operational aircraft in order to obtain their communications suites for new airframes. These dollar costs are summarized as follows:

	<i>In millions</i>
Fiscal year 1982-86, 9 C-130 airframes-----	\$310
Fiscal year 1982-86, 9 EC-130's [deleted]-----	75
Fiscal year 1983-84, 4 communications suites-----	82
Total -----	467

Operational performance: To perpetuate the TACAMO force of eighteen aircraft with the Hercules C-130 airframe would mean acceptance of known shortfalls in performance, growth potential and connectivity. This situation would continue and then be compounded by the need to commence programmatic action [deleted] to procure replacements for the next generation of dying EC-130s, which would begin to reach the end of extended service life [deleted].

TACMO CHOICE—ECX OR EC-130

Senator WARNER. Does it make better sense, rather than buying out the planned 18 aircraft EC-130 procurement—in view of the limitations inherent in this airframe—to reduce that buy and replace the EC-130's with a smaller number of individually more capable planes?

Captain DONOVAN. Yes.

SURVIVABLE AND ENDURING COMMUNICATIONS NEEDS

Senator WARNER. What effects has the reduced funding of the Survivable and Enduring Communications line item had on promising programs which could meaningfully improve C³ systems' enduring capabilities? What would be an appropriate level of funding for these programs, in view of the JCS' emphasis on survivable and enduring C³?

Captain DONOVAN. Reduced funding of the Survivable and Enduring Communications (SEC) line item [deleted] will not be implemented [deleted] nor will any of the specific elements of the SEC project be initiated [deleted]. The highest priority item in the project is the trans-attack and reconstitutable communications system [deleted].

ELF RECONSTITUTION POTENTIAL

Senator WARNER. Is it not correct that the development and deployment of the ELF technology and receiver equipment could allow—when combined with a mobile transportable ELF transmitter and rapidly deployable wires or other conduits—a rapidly reconstitutable ELF capability following an attack?

Captain DONOVAN. The statement is correct.

SLBM ACCURACY

Senator WARNER. In view of the successes achieved to date in the Trident I program, are you confident that substantial accuracy improvements, [deleted] are possible under the Improved Accuracy Program (IAP) and the Trident II advanced development program?

Admiral CLARK. We are confident that substantial accuracy improvements beyond those realized on Trident I are possible. The IAP is yielding an understanding of the major Trident I error contributors, and technology improvements which are expected to permit ICBM type accuracies at SLBM ranges. Current projections for Trident II are [deleted] 4,000 nm.

SLBM FUNDING

Senator WARNER. Do you believe we should divert funds from the planned buy of Trident I guidance packages to provide necessary funding for the Trident II ADP? What are the implications of such an action from the standpoint of committing us to at least an upgraded C-4, if not to a D-5?

Admiral CLARK. The implication of a reduction in Trident I guidance system procurement is that it represents a commitment to improve the accuracy of Trident I. We believe that these funds should be diverted if a commitment to improvement to Trident I accuracy is made. Further cost avoidance could result if a commitment to develop and deploy Trident II is made.

NEED FOR LARGE SLBM

Senator WARNER. What do you regard as the compelling reasons for seeking a large payload, hard-target kill capability in an SLBM?

Admiral CARTER. Using the entire volume of the TRIDENT submarine missile tube will enable us to increase the payload per missile tube [deleted]. For example, [deleted] TRIDENT SSBNs with the large TRIDENT II missile could provide the same capability as [deleted] TRIDENT submarines with the smaller C-4 missile. The savings in procurement and operating costs resulting from smaller force levels more than offset the R&D costs of a new missile.

The countervailing strategy requires a hard target kill capability in our strategic forces. Providing this capability in SLBMs does two things. First it provides a redundant capability to that existing in ICBM's and provides a hedge against ICBM vulnerabilities or unexpected system failures. Second, it provides a threat to high value Soviet targets that they cannot counter by further proliferation of their offensive nuclear forces.

MK-500 COMPATIBILITY

Senator WARNER. Would all of the candidates for follow-ons to the Trident I be compatible with the MK-500 Evader Maneuvering Warhead? What would be the incremental additional cost involved in maintaining our option to the MK-500 into production on [deleted] presently possible?

Admiral CLARK. All options now under consideration in the SLBM Modernization are planned to be compatible with the MK-500 Evader Maneuvering Re-entry Vehicle. The present 3½ year lead time for the MK-500 operational availability is based on long lead requirements for the initial production units and on DoE requirements. To maintain an option to place the MK-500 into production on a less than 3½ year lead time would in effect require authorization of a limited MK-500 production program consistent with the lead time desired. Costs for such a program(s) have not been determined. A decision to embark on any reduced lead time posture must also taken into account the DoE's capabilities and competing warhead production requirements.

MISSILE ACCURACY IMPROVEMENTS

Senator WARNER. How much technological risk is associated with obtaining the additional [deleted] reduction in CEP below current Navy projections for the Improved Accuracy Program [deleted] as mandated by Secretaries Brown and Weinberger? What is the marginal utility from the standpoint of operational flexibility and hard-target kill capability involved in [deleted] currently believed to be within the state of the art for a new missile?

Admiral CARTER. The Secretary of Defense directive on the Submarine Launched Ballistic Missile (SLBM) program did not mandate a CEP [deleted] but established [deleted] a goal. Achievement of the [deleted] CEP [deleted] does not involve technological risk since no fundamentally different technological approach is required. The degree of success in the several accuracy technologies now being pursued will determine the final accuracy outcome.

Against soft targets there is no advantage in improving the accuracy. Against very hard targets, [deleted] CEP results in an improvement [deleted] in kill probability. With regard to operational flexibility there is little advantage in improving the accuracy by the amount you describe.

SLBM MODERNIZATION

Senator WARNER. Do you have any concern that the technological risk involved in achieving improved CEPs through the C-4 TAP or the D-5 development programs may not justify closure of the Trident I guidance production pipeline at this time? What latitude with regard to this pipeline does the planned buy of Trident I's by the UK give us?

Admiral CLARK. The progress in the IAP achieved to date indicates there is little technological risk in achieving significantly improved accuracy. The risk in terminating the guidance production in lines would come from a decision not to modernize the SLBM force which would then require a restart of these produc-

tion lines. With the UK proceeding to acquire the Trident I missile system, these production lines would continue to operate for a minimum of one additional fiscal year expressly to meet UK planned requirements.

Senator WARNER. To what degree must a reprogramming of funds from Trident I long-lead procurement to Trident II development be regarded as a major commitment in a policy as well as economic sense to develop a follow-on SLBM?

Admiral CLARK. Reprogramming of funds from Trident I long-lead procurement to Trident II development is a policy commitment to improve the SLBM force by at least improving the accuracy of the Trident I. Should this commitment be made now, and cancelled later, the impact would be the requalification of some component production lines and possible redesign of some elements of the Trident I resulting in increased Trident costs.

TRIDENT I INVENTORY OBJECTIVE

Senator WARNER. If such a reprogramming action were to be approved by the Administration and the Congress, what would be the inventory objective for Trident I missiles?

Admiral CLARK. If such a reprogramming action were approved, an inventory objective of [deleted] Trident I missiles would be required to preserve the option for an upgraded Trident I missile. If, however, a decision is made to commit to a Trident II missile, the inventory objective of Trident I missiles would be reduced [deleted].

SLBM MODERNIZATION

Senator WARNER. Are the British concerned about the prospect of buying the Trident I system at a time when the United States seems ready to terminate its production in favor of Trident II? What effect do we anticipate a reprogramming of Trident I long-lead dollars to Trident II advanced development and the commitment it represents would have on the planned UK buy?

Admiral CLARK. This is really a question for the UK to answer. We will be keeping them in the picture as our plans for future SLBM programs develop.

The immediate effect of US reprogramming is to accelerate UK commitment of funds to procure guidance components while the production line remains in existence. This would be done in order to assure availability of MK5 guidance systems when needed, and to avoid the heavy costs of restart and requalification of the production source.

TRIDENT II DEVELOPMENT ALTERNATIVES

Senator WARNER. What alternatives exist to the Brown/Weinberger program for Trident II development which might result in an earlier IOC for this missile? What would be the associated costs, in dollar terms and in the terms of the probable reduced performance characteristics, of dropping the advanced development program at this time and proceeding directly into full scale engineering development?

Admiral CLARK. The earliest IOC for a Trident II missile would be [deleted]. This IOC can be achieved provided that full scale engineering development is authorized to commence in October 1981. The development costs for such a program would be the same [deleted] approximately \$9 billion, but the early years would require additional funding. The accuracy outcome at initial deployment of an accelerated missile system might be slightly lower than would be achieved with the currently planned program. If such were the case, further accuracy improvement would probably be affected after the initial operational test series. Range performance would probably not be significantly affected, however, some high risk technologies, such as a first stage extendable exist cone and an advanced aerospike, would be dropped from the program. These technologies are now being carried in case they are needed.

SLBM MODERNIZATION

Senator WARNER. From the moment a decision to go into full scale engineering development is made—and the necessary resources committed—how long would it take to reach an IOC? At what point in time would we expect the characteristics of the system to be reasonably clearly defined (2-stage versus 3-stage, clear deck versus basic D-5, et cetera)?

Admiral CLARK. The current program plan, i.e., the one supported by current budget requests, is to start full scale engineering development at the end of fiscal year 1983 resulting in an IOC [deleted]. The basic configuration of the weapon system will be selected during fiscal year 1983.

SSBN SECURITY

Senator WARNER. Have the previous estimates of the degree of survivability/invulnerability of strategic subs been altered since last year?

Admiral KELSO. [deleted].

Senator WARNER. What do we know about the improvements to Soviet anti-submarine capabilities represented by recently introduced systems (Alpha and Oscar submarines, ASW carriers of the *Minsk* class, and other antisubmarine vessels)?

Admiral KELSO. Tactical Soviet ASW-capable forces will continue to grow in capability. [Deleted]. Non-acoustic sensors such as magnetic anomaly detectors (MAD) are used for search of small, well-defined areas, [deleted]. As we look forward, we should expect an ever-increasing Soviet ASW effort. Historically, the more forces devoted to ASW, the more effective the capability and the continued increase in Soviet forces will undoubtedly result in an overall increase in ASW capability.

Senator WARNER. To what degree do we expect their appearance in numbers?

Admiral KELSO. It is estimated that before the end of the decade, a new class of carriers, probably nuclear powered, will enter service in the Soviet Navy. At least four new classes of cruiser-size [deleted] ships are projected to enter the force. At least two new classes of ASW-capable nuclear powered attack submarines are expected. [Deleted].

Senator WARNER. What effect will such a development have on projected U.S. SSBN invulnerabilities?

Admiral KELSO. [Deleted]. Our plans to counter this possible increased effectiveness include the deployment of the TRIDENT submarine and the TRIDENT missile. The longer range TRIDENT missile will permit operation of our submarines in more than ten times the present patrol areas thus increasing Soviet search areas significantly. The TRIDENT submarine incorporates significant quieting improvements and increased quiet patrol speeds to reduce detection and complicate search by advanced sensors. The larger TRIDENT submarine also permits installation of advanced countermeasures equipment as potential threats become identified. Advances incorporated into the TRIDENT weapons system will provide increased flexibility in the range of available patrol depths and speeds. [Deleted]. Our SSBN Security Program and the improvements in survivability we have put into our submarine and weapons systems are expected to provide sufficient and flexible response to future threats which might develop from Soviet research and provide for continued survivability of our SSBN force.

Senator WARNER. Dr. Perry testified last year that if the Soviets "could locate (our) submarines [deleted] they could barrage attack that area." With what weapon or weapon systems would we expect the Soviets to perform such an attack? What numbers of these weapons would be required— [deleted]—to significantly degrade our SSBN deterrent?

Admiral KELSO. Dr. Perry's hypothetical example assumed 20 U.S. SSBNs were at sea, that all 20 SSBNs could be simultaneously located [deleted] and that Soviet ICBMs [deleted] would be used in a barrage attack of the SSBN force. Based on these assumptions, Dr. Perry calculated that a minimum [deleted] would be required to destroy the 20 SSBNs at sea. This hypothesis assumes employment of the Soviet ICBM force against U.S. SSBNs as a pre-emptive attack similar to that of attack against U.S. ICBMs. Note that the assumption is based on simultaneous location of all U.S. SSBNs at sea [deleted]. This hypothesis also rapidly degrades such that if location [deleted] is assumed, a minimum of [deleted] warheads becomes required which, as Dr. Perry testified, would make such an attack totally infeasible.

Admiral CARTER. If the Soviets could achieve a capability of maintaining a submarine location uncertainty [deleted] a barrage of the ocean area might be carried out by an ICBM, MRBM or SLBM attack if the ballistic missiles were specifically designed for such a mission. [deleted]. However, assuming that such reentry vehicles were deployed with a nuclear warhead [deleted] RVs

(number dependent on SSBN operating depth) would have to be allocated to cover an ocean area associated with a single SSBN location [deleted] to insure a high probability of damaging a submarine. If the location uncertainty were doubled [deleted] the number of warheads required would increase by a factor of four. From another perspective if the Soviets dedicated their entire ICBM force to ocean bombardment, they could effectively cover less than [deleted] the ocean area available to the TRIDENT system.

To degrade our deterrent significantly a large percentage of our at-sea submarines must be localized and attacked over a very short time span. Herein lies the principal difficulty for the Soviets. A capability of intermittent or occasional detection [deleted] does not translate into near simultaneous detection of a large fraction of the force. Additionally there are very difficult problems of command, control, and coordination associated with real time targeting of a large number of nuclear warheads against a moving target in a short period of time.

POLARIS RETIREMENT

Senator WARNER. Secretary of the Navy Lehman said on February 5th in testimony before this Committee that he was strongly opposed to the retirement of Polaris based on the criterion of meeting the limitations of SALT. He said he believes that those are no longer valid limitations and that there will be no pressure from the Navy to retire them except for non-SALT related reasons. Are there other compelling reasons for retiring these submarines?

Admiral KELSO. The two Polaris SSBN's which were decommissioned on February 28th and dismantled in accordance with the provisions of the SALT I Interim Agreement, were planned for inactivation at about this time irrespective of SALT requirements. The remaining 598 and 608 class submarines can be operated until they complete at least 25 years of service life. There is no compelling reason to retire them before that time.

POLARIS USEFUL LIFE

Senator WARNER. How much useful life is left in the remaining Polaris submarines?

Admiral KELSO. All of the Polaris submarines were commissioned between 1959 and 1963. Assuming a 25 year life they should be retired between 1984 and 1988.

POLARIS CONVERSION TO SSN

Senator WARNER. In view of Secretary Lehman's assessment of the need to comply with the SALT restrictions on SLBM tube numbers, could the Navy not convert the remaining Polaris SSBNs to an attack role at relatively low cost by avoiding the expensive dismantling procedures required under SALT and emplacing concrete plugs in the missile tubes?

Admiral KELSO. Conversion of the submarines to an attack role does not require dismantling. Dismantlement is required to comply with the SALT I Agreement if Polaris tubes are chosen to compensate for the tubes of OHIO class submarines. Conversion to SSNs and dismantlement in accordance with SALT are separate issues. Currently three Polaris submarines are operating as attack submarines in the Pacific with missile compartments intact and concrete cans placed in the missile tubes to replace the weight lost when the missiles were removed. These cans are removable in the future if desired.

Senator WARNER. Has the Navy concluded that, notwithstanding its shortage of nuclear attack submarines, limitations on the number of torpedoes these subs can carry or other considerations prevent the Polaris from being used usefully in this role?

Admiral KELSO. Although there are limitations associated with the use of the Polaris submarines as attack boats, the Navy has concluded that they can be usefully employed in this new role.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY DR. SEYMOUR L. ZEIBERG, DEPUTY SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING

TRIDENT II MISSILE PROCUREMENT PRACTICES

Senator THURMOND. Dr. Zeiberg, some members of this committee have questioned the Navy's noncompetitive procurement practices for the Trident II missile, especially the noncompetitive "joint venture" of two contractors for Trident

D-5 propulsion. The Secretary of Defense was to have provided the Committee with a revised Trident II management plan by January 31, providing a better justification for any planned noncompetitive procurement actions. Since that report has not been delivered, I would like to ask you a few questions about it.

Why is this report a month late, and when do you expect to deliver it to us?

Dr. ZEIBERG. A report title "SLBM Modernization Acquisition Plan" was signed by the Secretary of Defense on 6 March 1981 and was forwarded to Chairman of the Senate and House Armed Services Committees. The Secretary of Defense delayed sending the report to Congress until it was reviewed by the next Under Secretary of Defense for Research and Engineering.

TRIDENT II COMPETITION

Senator THURMOND. What will the report say about Trident II competition in general, and D-5 propulsion competition in particular?

Dr. ZEIBERG. The synopsis from the report is supplied below and it provides an overview of what the report will say about competition in general in the Submarine Launched Ballistic Missile Modernization Program of which Trident II is only one of the options:

Synopsis

The use of competitive practices in the Submarine Launched Ballistic Missile (SLBM) Modernization Program has been reviewed and an acquisition plan developed to make optimum use of competition within the programmatic, technical and management parameters of the SLBM Modernization Program. The key features of this plan are:

Retention of the management structure successfully employed in previous SLBM programs (POLARIS, POSEIDON, TRIDENT I) with the Navy's Strategic Systems Project Office functioning as its own prime contractor/integrator for the overall weapon system.

An evolutionary development strategy to minimize risks, shorten the development period, and contain total costs. The existing Navy/contractor subsystem management teams will be retained in order to obtain the most value from the previous related research and development efforts and to make maximum use of existing expertise, documentation, and facilities.

Maximum competition at the subcontract level consistent with the evolutionary nature of the program, technical requirements and good business practices.

Competition for production of the new guidance systems between two contractors qualified during the engineering development phase.

Neither soliciting nor precluding joint ventures competing for subcontracts, since to do so would be inconsistent with the responsibility of the prime subsystem contractor to maximize competition as required by the Defense Acquisition Regulations.

The report does not specifically address a D-5 propulsion competition. However, the plan is to conduct a competition at the subcontractor level in order to select the contractors who will develop and produce the propulsion subsystem for the Trident II missile.

SLBM COMPETITION

Senator THURMOND. How do you justify a quarter of a century of noncompetitive procurement for submarine-launched ballistic missiles?

Dr. ZEIBERG. Competition has been used extensively throughout the 25-year history of the Fleet Ballistic Missile Program. A significant portion of the weapon system procurement is accomplished competitively at the subcontract level while retaining the thoroughly experienced team of subsystem prime contractors who have successively developed, produced, and supported five generations of Fleet Ballistic Missiles (because of their demonstrated technical knowledge, experience, and engineering capability). The SLBM Modernization acquisition plan addresses this in more detail.

TRIDENT SSBN'S

Senator THURMOND. What would be the cost of locating at sea an increased Trident force with the warhead delivery capability of the MX program?

Dr. ZEIBERG. If the Trident II (D-5) missile is developed, [deleted] Trident submarines can provide the same [deleted] surviving warheads on a day-to-day alert basis as the MX baseline system was designed to provide. It should also be noted that [deleted] Trident submarines, again with the Trident II (D-5) missile, can provide the same capability [deleted]. Considering that 9 Trident SSBNs

have been authorized and funded to date, [deleted] Trident SSBN force with the D-5 missile, which will provide a surviving capability equal to that of the MX [deleted] can be procured for an additional \$33 billion. This estimate in FY 1980 dollars includes development costs, military construction, missile and submarine costs.

TRIDENT SUBMARINE DELIVERY DELAYS

Senator THURMOND. How much has the Trident program been delayed to date, and what is your degree of confidence that the current projected schedules can be met?

Dr. ZEIBERG. The lead Trident submarine contract delivery date was in April 1979. Electric Boat Division has announced revised delivery dates in February 1978, in March 1980 and in August 1980. Although Electric Boat in August 1980 projected a 29 June 1981 delivery date for the *Ohio*, the shipbuilder subsequently reported in October 1980 that further delays were possible. Since October 1980 Electric Boat has repeatedly refused to provide the Navy with detailed Trident ship construction schedules. Based on my knowledge of construction progress to date, it is obvious that a June 1981 delivery date cannot be met. My most optimistic projection is that *Ohio* will be delivered in December 1981. However, *Ohio's* delivery could slip into 1982 and follow-on ship deliveries could be delayed further unless significant improvements are made to accelerate correction of known deficiencies and to improve management practices, emphasis on quality assurance and work scheduling.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

SOVIET THREAT

Senator LEVIN. Last year before our R&D subcommittee, I asked Vice Admiral Griffiths, then DCNO for Submarine Warfare, and Rear Admiral Wertheim, then Director of Strategic Projects, whether since their appearance before our committee two years ago, when they testified [deleted] there had been any changes in the Soviet threat to these submarines in terms of greatly-improved Soviet ASW capabilities.

Both admirals said [deleted].

Admiral Carter and Admiral Kelso, since one year ago has there been any change in the Soviet threat to our strategic ballistic missile submarines in terms of greatly improved Soviet ASW capabilities?

Admiral KELSO. [deleted]. These estimates are founded on the continuing ability of our SSBN forces to maintain their security advantage through aggressive development of countermeasures.

Admiral CARTER. The Soviets continue a vigorous R&D program in ASW and, as you know, ASW is a primary mission of their Navy, a Navy that is being vigorously modernized. [deleted]. Our programs—improved missile ranges, quieter submarines like TRIDENT, and the ELF system to break our umbilical to the surface in our day-to-day operation—are all designed to insure that we stay ahead of any improvements in Soviet ASW capabilities.

SSBN SURVIVABILITY

Senator LEVIN. Admiral Griffiths also stated: "We believe that Soviet ASW capabilities will improve, but that introduction of the Trident missile and Trident submarine with the corresponding expanded operating areas and improved acoustic quieting will provide continued survivability. We believe the Soviets have [deleted]."

Admiral Carter and Admiral Kelso, one year later is this still an accurate assessment [deleted] of our strategic ballistic missile submarines?

Admiral CARTER. In my view, yes. I think it is important, however, in interpreting my answer to bear in mind that the reason for this [deleted] is our aggressive R&D and improvement programs [deleted].

Admiral KELSO. There has been no change in our assessment of the Soviet threat to our SSBNs. [deleted]. This assessment is based on the continuing aggressive development and deployment of improved systems, such as the Trident missile and acoustic quieting, to maintain this security advantage. It becomes increasingly clear that effective countermeasures for potential future ASW sensors must include the capability to operate the SSBN at the optimum speed and depth over the full range of the submarine's mobility.

SSBN SECURITY

Senator LEVIN. Admiral Kelso and Admiral Carter, the U.S. Navy is many years "ahead" of the Soviet Navy in ASW capabilities, is it not? Would it be fair to say that we are [deleted] ahead of the Soviets in these capabilities even at the present time?

Admiral KELSO. [Deleted.] This can be attributed to U.S. employment of multiple ASW platforms (air, surface and subsurface) over an extensive portion of the world's oceans [deleted] when faced with projected quantitative and qualitative improvements by the Soviets, it is not prudent to specify our advantage in terms of a specific time interval. Only aggressive deployment of improved systems, such as the Trident missile and improved acoustic quieting can ensure a continuing security advantage. Ability to operate the SSBN [deleted] may be necessary to ensure this security advantage against potential future ASW sensors.

Admiral CARTER. I believe that is a fair statement so long as we keep in mind that an ASW capability is a relative thing. To maintain this advantage our programs must keep pace with the programs of our adversaries.

SSBN COMMUNICATIONS

Senator LEVIN. Since, [deleted] according to Admiral Griffiths?

Admiral CARTER. Yes, I would agree that is an accurate statement today, but we should appreciate there are at least two different detection mechanisms involved. Against the wire, we are worried about [deleted] a technology that has been around for a long time and one in which future improvements are likely to be marginal. Against the buoy one mechanism is [deleted] a relatively new technique and one in which quantum improvements in capability could be realized over a relatively short time span.

NONACOUSTIC DETECTION

Senator LEVIN. Admiral Carter, Dr. Zeiberg discussed the hypothetical possibility of the Soviets developing some type of [deleted].

Admiral CARTER. Dr. Zeiberg referred to [deleted] Soviet research in aircraft [deleted]. Development of [deleted] aircraft, even if only marginally effective, has the potential of significantly increased ASW [deleted] U.S. research clearly indicates that submarine operation [deleted].

SSBN VULNERABILITY

Senator LEVIN. I asked you before whether you agreed with the conclusion that, despite the billions of rubles and dollars the Soviets have expended during the past decades to improve their ASW capabilities, [deleted]. You responded that you agreed with this statement.

The conclusion I asked whether you agreed with would have also included this [deleted] Dr. Zeiberg mentioned, would you not agree?

Admiral CARTER. Yes, I agree.

SOVIET ASW CAPABILITIES

Senator LEVIN. Thus, this research also has failed to provide the Soviets with the capabilities [deleted] is that not correct?

Admiral CARTER. [Deleted].

SSBN COMMUNICATIONS

Senator LEVIN. Admiral Carter, in your statement you say the following about the proposed ELF system:

"ELF is not a substitute for an existing system; rather it complements existing very low frequency (VLF) transmitters ashore, TACAMO (C² aircraft), and satellite systems."

Admiral, how many communications does the Navy currently rely on to maintain continuous communications between the shore and its missile submarines?

ADMIRAL CARTER. We currently utilize only a few of our systems on a continuous basis. These are the fixed VLF/LF and the HF broadcasts which have provided worldwide coverage for many years. Our remaining systems, which

span the frequency spectrum from VLF to the UHF, are generally reserved for use as a backup to provide connectivity should our primary systems be destroyed. I might add that our use of systems which span the frequency spectrum not only provides redundant paths to the force, but also complicates the Soviet C³ jamming problem.

Senator LEVIN. From your statement can we conclude that the Navy will continue to use these as well as the ELF system is the latter if deployed?

Admiral CARTER. Yes, that is an accurate statement. The ELF system as currently proposed is not intended to serve as a replacement for any of our present day system. The unique contribution of ELF will be to sever the antenna umbilical which ties our submarines to the surface. This will allow our submarines to utilize their depth and speed capabilities to best advantage, thereby enhancing their flexibility. [deleted]. Occasional detections could compromise peacetime deterrent patrol patterns.

Senator LEVIN. Has the Navy determined what will be the operating procedures for using all of these systems together? For example, will each SSBN alternate using each of the systems or will it continue to use all of them simultaneously?

Admiral CARTER. We have, by design, integrated a great many systems into our communications architecture with excellent results. In fact, it is just such a mix of systems which provides for assured connectivity to the submarine force. We do not anticipate any major changes in this architecture with the advent of ELF. Currently, our forces operate on a broadcast system. In peacetime, as in periods of crisis, each [deleted] submarine constantly monitors a VLF/HF broadcast [deleted].

Senator LEVIN. If the Navy is going to rely only on the ELF system as its primary system and do away with use of the other systems simultaneously [deleted] aren't you discarding the redundancy of communications systems which gives you more confidence or a higher probability that you can maintain continuous communications with at least one of the systems between shore and ship?

Admiral CARTER. While ELF will serve as a primary means of maintaining contact with the submarine force, we have no intentions of doing away with our other systems. We are fully aware that ELF is a soft, ~~and~~ system which cannot be expected to survive into the trans-attack period. Its great value is prior to major nuclear exchanges. Therefore, we fully intend to retain our other systems in order to maintain a redundant and survivable capability to control our forces.

Senator LEVIN. Why does the Navy have so much confidence in the ELF system, which has only been tested but has not withstood the rigors of daily use, that it is willing to shift its primary reliance for communications with the most survivable part of our nuclear deterrent Triad to it as a single system and away from the other redundant systems?

Admiral CARTER. It is very important to understand that ELF does not, in fact, reduce the necessity for our other systems. ELF's primary contribution will be to enhance the survivability and flexibility of the SSBN force.

While we do intend to utilize ELF as our primary peacetime method of maintaining continuous contact with the force, we shall in no way reduce the availability of our other redundant methods of communications. ELF will serve as a complement to, rather than a replacement for, our current systems.

Our willingness to shift from VLF to ELF as our primary means of contact stems not from any failing of the VLF system, but is derived from ELF's unique capability to penetrate seawater. Whereas a VLF signal is able to penetrate [deleted] ELF has the ability to reach our submarines at much greater depths.

Additionally, our [deleted] submarines are currently constrained to a relatively low speed due to the requirement for a VLF antenna to be towed near the surface. ELF however, requires no long trailing antennas and therefore would allow the submarine greater flexibility in speed and maneuverability.

ELF SYSTEM

Senator LEVIN. Another justification some use to promote the ELF system is that it removes the speed and depth restrictions on SSBNs which are now required when an SSBN [deleted].

Is it not true that under current Navy plans it can implement improvements [deleted] which would permit a submarine to operate at the same speeds and depths at which it states it will operate the ELF system?

If the system is only being developed for SSNs at present, why shouldn't it be adopted for the missile submarines?

Captain DONOVAN. The towed buoy antenna system installed in SSBNs today has low reliability. The Navy is testing a replacement buoy which incorporates features which are expected to improve reliability and utility of the buoy but will not make significant changes to buoy handling characteristics at the submarine speed and depth limitations necessary while flying the buoy. This buoy is known as the Poseidon communications buoy. It uses the successful hydrodynamic shape and many of the electronic components developed for the Trident communications buoy but is smaller because of the size of the submarines which will use it. The Poseidon and the Trident communications buoys are capable only of communications reception.

The Navy also has under development a communications buoy for attack submarines (SSNs). This is called the Buoy Integrated Antenna System (BIAS) which is capable of carrying antennas for transmission as well as reception. This attack submarine communications buoy also uses the new hydrodynamic shape and has some electronic components in common with the other communications buoys. It will also, if development goals are met, increase the submarine depth and speed operating range during buoy use because of a significantly different buoy handling system. Strenuous testing and evaluation of this buoy have not yet corrected the numerous problems encountered in a complex electro-hydraulic mechanical system operating in the hostile ocean environment.

As a long term conceptual goal, it is expected that all submarines will be equipped with a reliable communications buoy system capable of two-way communications with the highest degree of commonality attainable between different types of submarines. Even if this goal is met at some distant time, the physical limitations of radio signal penetration of seawater will require the antennas to be at or near the surface in order to receive communications and above the surface for transmission. Antennas at or near the surface have the potential of being detected. An ELF antenna streamed from a deeply submerged submarine does not.

Admiral CARTER. The Navy does have an ongoing buoy improvement program which strives to increase the reliability and capability of our bouys. Unfortunately, we have not been able to design a buoy capable of operating at the depth and speed envisioned for ELF. Providing we could do so, such an antenna would do nothing to detract from ELF's importance. VLF buoys and floating antennas will always represent near-surface observables. It is just such an umbilical that we are striving to sever. Due to the varying structural differences between attack and missile submarines it is not always feasible to use identical buoys on all submarines. However, as new buoy technology is perfected, SSN/SSBN buoys are designed to achieve maximum feasible commonality.

SSBN SURVIVABILITY

Senator LEVIN. A major advantage of the Trident I missile as far as SSBN survivability is concerned is that its longer range, compared with Poseidon missiles gives our SSBNs more ocean in which they can hide.

Once we deploy the Trident II, which has even longer range than the Trident I missile, this will make the Soviets ASW tasks even more difficult because of the even larger ocean areas in which our missile submarines could hide, would you not agree? Thus our SSBNs will be even safer and more survivable in the future against the Soviet threat, correct?

Admiral CARTER. Yes, in the sense that the Soviets will have to search out a larger area in their attempt to detect our submarines. The concept of the Trident system—and this included not only the missile but the submarine and supporting C²—is to minimize the observables. For example, making the submarine as quiet as possible and breaking the antenna umbilical to the surface impacts on the technological sophistication that must be incorporated in their search equipment. The increased ocean area affects enemy force levels and costs to threaten us.

[Deleted].

Senator LEVIN. Our committee has often been told that Soviet [deleted].

If this is correct, why shouldn't the U.S. [deleted] further increasing their survivability against Soviet ASW weapons?

Admiral CARTER. [deleted] U.S. submarines are currently under development to provide added protection against active sonar used by ASW warships and submarines and against active sonar torpedoes. [Deleted].

Senator LEVIN. I understand that we are experimenting [deleted] currently. Wouldn't such [deleted] represent a relatively inexpensive per submarine investment which could increase our SSBN survivability?

Admiral CARTER. [deleted] U.S. submarines are currently under development. Preliminary cost estimates are that a minimum of six million dollars per submarine would be required for such installations plus significant upgrading of shipyards to perform such installations. [Deleted].

[Whereupon, at 11:10 a.m., the hearing adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, MARCH 4, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

STRATEGIC DEFENSE

The subcommittee met in executive session, at 8:30 a.m., in room 224, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Members present: Senators Warner, Goldwater, Quayle, and Jackson. Also present: Senator Wallop.

Staff present: Paul C. Besozzi, minority counsel; Christine E. Cowart, assistant chief clerk; Frank J. Gaffney, Ronald F. Lehman, and E. George Riedel, professional staff members; Marie Fabrizio Dickinson, Brenda K. Hudson, Jacquie S. O'Grady, and Mary A. Shields, staff assistants.

Also present: Chris Lehman, assistant to Senator Warner; Frank Krebs, assistant to Senator Cannon; Greg Pallas, assistant to Senator Exon; Willis Smith, assistant to Senator Jackson and Angelo Codevilla, assistant to Senator Wallop.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. Good morning, gentlemen. The committee will come to order.

There being no objection, the committee will go into executive session for national security reasons.

Today the Subcommittee on Strategic and Theater Nuclear Forces meets to receive testimony on America's strategic research programs related to strategic defensive systems. I would like to welcome to the committee today our witnesses: Dr. James P. Wade, Assistant to the Secretary of Defense for Atomic Energy and Acting Principal Deputy Under Secretary of Defense for Research and Engineering; Dr. Seymour L. Zeiberg, Deputy Under Secretary of Defense for Research and Engineering (strategic and space systems); Dr. George Millburn, Acting Deputy Under Secretary of Defense (research and advanced technology); and Maj. Gen. Grayson D. Tate, U.S. Army, program manager, ballistic missile defense. In addition I would also like to acknowl-

edge the presence of Dr. Robert Fossum, Director of the Defense Advanced Research Projects Agency.

America's strategic defensive programs have, since the conclusion of the 1972 Antiballistic Missile Treaty, been maintained at a fairly low level of research effort. The United States briefly deployed antiballistic missile defenses at the one site permitted under the Antiballistic Missile Treaty but has since dismantled all major components except the perimeter acquisition radar. The major focus of the Army's ballistic missile defense program today involves technologies greatly different from those employed in the original Safeguard concept.

Much attention has been given to the Army's low altitude defense system (LoADS) which would be deployed in the mid to the late eighties in a multiple protective structure system along with MX missiles. By defending only those shelters containing MX missiles or LoADS systems, rather than empty shelters, LoADS exploits the multiple protective structure system to gain great leverage over an attacker.

Initial studies indicate that LoADS in multiple protective structures may be a more cost effective response to an expanded Soviet threat than simply increasing the number of MX/MPS shelters. However, concern remains over the technological feasibility of LoADS and practical questions must be answered about how LoADS would actually be deployed. LoADS is a terminal defense system.

Less near term than LoADS for ballistic missile defense are concepts for intercepting missile reentry vehicles before they enter the atmosphere. Such exoatmospheric interceptors would obtain leverage over attacking forces by selectively defending ICBM fields. This would prevent the attacker from overwhelming defenses protecting those ICBM's which the United States has selected to defend. The technologies required for exoatmospheric intercept are far more difficult than those associated with LoADS, but an "overlay" combining exoatmospheric intercept and LoADS might well be able to defend successfully fixed ICBM silos against relatively large Soviet threats. Nevertheless, many uncertainties concerning technological and operational feasibility remain.

Over the last 10 years the United States has conducted extensive research and made great progress in the development of high energy lasers. The power of high energy lasers has increased to the point where strategic applications are now conceivable. Nevertheless, a great many technical, systems and operational obstacles remain to be overcome. The high cost and great technical risk associated with various approaches to high energy laser strategic weapon systems makes it difficult to commit to a specific program for early deployment of actual weapons.

Because of the uncertainties associated with ballistic missile defense and strategic high energy lasers, the Armed Services Committee requested two reports from the Department of Defense outlining possibilities and options for strategic defenses. Today we will receive testimony on the status of those reports and on the issues concerned.

Dr. Wade, you may proceed.

STATEMENT OF JAMES P. WADE, JR., ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY, AND ACTING PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING

Dr. WADE. Thank you, sir.

Mr. Chairman and members of the subcommittee: I am pleased to be here today to provide an overview of our strategic defensive programs. Because of our strategic offensive forces to date have borne the principal burden of deterrence, our strategic defensive programs have generally been structured to provide a limited capability toward providing effective options for the future. Considering options which may have a significant impact in the future, I plan to focus my remarks today on two subjects: Ballistic missile defense and space laser weapons.

Such systems are capable of having a significant impact on the strategic balance as we proceed into this decade and beyond. They have been of high interest to the Congress, as underscored by congressionally directed reports. We are now in the final phases of completing our report on ballistic missile defense. We have conducted an investigation on space laser weapons, but wish to complete a Defense Science Board review before forwarding that report to the Congress in mid-May.

Mr. Chairman, I will now provide a brief overview. I will then ask Dr. Zeiberg, Deputy Under Secretary of Defense for Strategic and Space Systems, to provide a more detailed presentation on the ballistic missile defense report. Next, Major General Tate, the ballistic missile defense program manager, will provide a brief overview of the fiscal year 1982 ballistic missile defense program, including a discussion of future options. Finally, Dr. Millburn, Acting Deputy Under Secretary of Defense for Research and Advanced Technology, will provide an overview of our space laser weapon investigation. I would note that these results should be viewed as preliminary until we complete Defense Science Board review.

Senator WARNER. Can you give us, Dr. Wade, an estimate on that report from the Defense Science Board review? We have to consider it in terms of the mission of this subcommittee and eventually the obligation of the full committee to act on the authorization.

Dr. WADE. Yes, sir. We hope to have the report final by mid-May. If it would be of help, we can provide an oral report some time in early May.

Senator WARNER. Chairman Tower indicated he wants a markup on this bill the latter part of this month, and perhaps go to the floor some time in April.

A number of my colleagues are very much interested in this subject. We are liable to have a lively debate on the floor. It has been almost a full year since we have had these reports of investigations. What can we do about it?

Dr. WADE. I can go back and take a look at the schedule. I think the key point you would like is the wisdom and advice of the Defense

Science Board of this report, noting the 6 weeks that is required to get the team together.

Dr. MILLBURN. We will have the first organizational meeting of the Defense Science Board team on the 27th of March.

Senator WARNER. This is not a subject before it?

Dr. MILLBURN. This will be the subject of that committee. We anticipate it will take them approximately 1 month to go through the report, phrase their questions, have us answer their questions, and then to formulate their own recommendations to the Secretary.

By approximately the middle of April we should have an oral report from that committee. They will then submit their written report approximately 2 weeks later. We would probably be prepared to give Congress an oral report some time in that time period, and the written report, after we coordinate it and staff it by the middle of May to Congress.

Senator WARNER. You are familiar with the budget cycle here. So we will just have to do the best we can.

Thank you.

Dr. WADE. Let me turn to ballistic missile defense.

In the decade since the extensive debates about the deployment of the Safeguard ballistic missile defense (BMD) system, much has changed with regard to BMD. The Safeguard test program and subsequent technology efforts have made significant progress in removing many of the uncertainties as well as improving the performance and potential cost effectiveness of BMD. The strategic situation has changed substantially in that the Soviet ICBM force now poses a serious threat to our Minuteman force as currently deployed. Perceptions of the potential impact of BMD on strategic stability have also changed.

In the late sixties and early seventies some believed that BMD, as exemplified by Sentinel/Safeguard, might not work, would be easily countermeasured, and would foster a new arms race. However, it now appears that emerging technology, if successfully validated in a BMD context, should allow effective defense of hard targets at favorable cost exchange ratios.

It is generally recognized that the United States is now entering a period during which we will face an unacceptably low level of ICBM survivability in the event of a counterforce strike by the Soviets against our Minutemen force. This has been brought about by the increased number of Soviet weapons available through the large scale introduction of multiple independently targetable reentry vehicle (MIRV) systems, and by substantial improvements in the delivery accuracy of Soviet ICBM's.

The planned U.S. response—MX—should greatly increase ICBM survivability by the late 1980's. However, if the Soviet threat expands significantly beyond the levels currently projected, other U.S. actions would be necessary to preserve adequate survivability of our ICBM's. Active defense of MX using BMD appears to be a cost-effective option against substantial increases in the U.S.S.R. ICBM threat.

Senator GOLDWATER. When you use the term "MX" are you talking about the entire deployed system, or just the defensive weapon?

Dr. WADE. We are talking about MX in the deployment concept that is currently underway. I would also note that other basing options

which will be reviewed look attractive as far as the BMD option is concerned.

Senator GOLDWATER. MX is not a certainty.

Dr. WADE. That is correct, sir, as far as the current basing concept.

Senator GOLDWATER. I think it is well to make it clear that you are talking about either improved Minuteman or the entire MX complex that the Defense Department wants.

Dr. WADE. That is right; yes.

Senator WARNER. Proceed, Doctor.

Dr. WADE. Analysis performed to date shows that a limited deployment of BMD to defend the warning and attack assessment radar (PARCS) at Grand Forks could assure the survival of the radar [deleted].

These BMD options are viable possibilities for responses to the Soviet threat against our strategic land based deterrent forces. The system concepts appear workable and some of the basic technology has been demonstrated. However, there are important technological and system issues which remain to be resolved. Substantial development effort will be required in the next several years to provide confidence that these projected BMD capabilities are realizable in the timeframe of interest.

The 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty) between the United States and the U.S.S.R. places severe limits on the deployment of BMD systems for ICBM defense. Both the United States and U.S.S.R. are limited to the deployment of no more than 100 interceptors and launchers and 20 radars. These are not sufficient quantities to provide a significant defense of either the Minuteman force or MX.

On the other hand, the ABM Treaty places very few limits on research and development—no development, testing, or deployment of sea-based, air-based, space-based, or mobile land-based systems and no reloadable launchers or interceptors capable of delivering more than one independently guided warhead. However, neither of the principal BMD concepts for ICBM defense that will be discussed—low altitude defense or the overlay defense—can be fully developed under the ABM Treaty. Nonetheless, we have developed programs to determine if the projected capabilities are realizable, and these programs can be completed within the constraints of the ABM Treaty.

A limited deployment of a BMD at Grand Forks can also be completed under the terms of the ABM Treaty.

The BMD program is focused on two principal defense concepts, low altitude defense (LoADS) and overlay defense. Either individually, or together in a layered defense, these concepts offer potential solutions for improving ICBM survivability, even in the event of considerable growth in the Soviet threat. These two concepts will be discussed in further detail by the following witnesses.

SPACE LASER WEAPONS

Development of an effective and survivable space-based laser force could have a decisive impact on the character of warfare and on the strategic balance of power. There are, however, areas of major uncertainty in our ability to realize this potential. Substantial advancement

beyond current technology is required, not only in lasers, but also in surveillance, command and control, and launch vehicle capabilities.

The ability of a laser weapon system to survive against the many potential threats and the levels of attack which might be anticipated is a concern which must also be examined in detail.

Finally, the costs of such a system will be high, although such cost estimates are highly uncertain because of the degree of advancement required relative to present technology.

Our best assessments indicate that the earliest time that space-based laser weapons could make a contribution to U.S. military posture is [deleted]. There is a need now, however, to understand more fully their potential so that, at a minimum, we can plan an intelligent response in the event that an adversary should deploy such weapons. Thus, the primary questions to be addressed by the DOD are whether the future military potential of such weapons, as judged today, warrant acceleration of the space laser program and if so, to what degree.

At least four aspects of space laser weapons should be addressed before decisions are made with respect to the rate of investment in their development:

The potential utility of space-based laser weapons.

The current state of technology and projected rate of attainment of the required technology levels, together with the associated costs and risks.

The possible weapon deployment options, together with their schedules and costs, and comparison with alternate means to accomplish military missions.

The impact of the development and deployment on national policy.

POTENTIAL UTILITY OF SPACE-BASED LASERS

The least demanding potential mission for space-based lasers is the antisatellite mission. Offensive antisatellite operations against a few key satellites can be accomplished with a maneuverable laser satellite that has a system brightness that is on the order of that recently demonstrated in the Airborne Laser Laboratory [deleted].

Brightness is a measure of the capability to concentrate power onto a small spot. See table 1.

TABLE 1.—BRIGHTNESS OF SPACE-BASED LASER CONCEPTS

Brightness (watts/ster)	Power (megawatts)	Aperture diameter (meter)	Beam spread (microradians)
(Deleted.)			

Dr. WADE. Another military application of space-based lasers is to attack aircraft targets. Even more demanding is BMD, in which space-based lasers, in conjunction with conventional BMD systems, might provide an effective defense against ICBM's. But the characteristics of such a system are quite uncertain, largely because of the [deleted] when the Soviets respond to U.S. development of space-based laser weapons. Even the most modest of space-based laser BMD systems would have an instantaneous and global capability against very large numbers of aircraft and satellites.

The ultimate impact of a successful space laser system development on the strategic balance will be dictated by the major uncertainties which remain in survivability, weapon lethality, technology availability, and systems engineering. These must be resolved through analysis, design, development and measurements.

STATE OF TECHNOLOGY AND DEVELOPMENTS

The technology goals of the current program are to develop component capabilities that, if integrated into a system, would yield brightness of the order of [deleted]. Under the current funding-limited program, these component technology goals will not be attained until [deleted]. We expect that technology can support the eventual development of chemical laser systems with brightness levels of [deleted].

Since brightness is inversely proportional to laser wavelengths, lasers with shorter wavelengths become increasingly attractive to fulfill the requirements of BMD. While the technology of short wavelength laser systems is less mature, increased attention in this area of technology is in order.

A moderate risk program has been defined to advance from the current [deleted] demonstrated by the Airborne Laser Laboratory to development of systems having a brightness of [deleted]. With higher risk, paths have been defined to develop systems in the 1990's having a brightness of up to [deleted]. Beyond that, there are advanced concepts under development which, if feasible, could extend brightness to [deleted] and beyond in the [deleted].

Advanced space-based surveillance systems, not currently planned, would be necessary to detect and track large numbers of targets for significant space-based laser missions. The separate surveillance systems required for aircraft or ballistic missile targets would be major systems developments in their own right. While the technology for such surveillance is under development, there are no current plans to deploy such systems. Also an advanced launch system such as the proposed Shuttle derivation launch vehicle (SDLV) or heavy lift launch vehicle (HLV) would be required to place space-based laser systems in orbit in a single launch. Otherwise, multiple shuttle launches and inspace assembly would be necessary.

Senator GOLDWATER. When you give the W/sr of [deleted] power, do you have any reference in that formula to range? Does brightness control range?

Dr. MILLBURN. Yes, brightness is proportional to the square of the range. The effective range is proportional to the square root of the brightness of any given system.

Senator GOLDWATER. We have this laser out in New Mexico, the last time I was out there, that has a [deleted]. What would its brightness be?

Dr. MILLBURN. Which system is that, sir?

Senator GOLDWATER. The one in Kirkland Air Force Base, N. Mex.

Dr. MILLBURN. Is that the Airborne Laser Laboratory?

Senator GOLDWATER. It is gaseous.

Dr. MILLBURN. Brightness is [deleted].

Senator GOLDWATER. That is [deleted].

Dr. MILLBURN. Against types of targets that they are considering using it. The formula for brightness is that the brightness is equal to the flux required on the target to kill it or to damage it, times the square of the range divided by the length of time that the beam is held on that target.

Senator GOLDWATER. We are not too close to what you want yet.

Dr. MILLBURN. No.

POSSIBLE WEAPON DEPLOYMENT OPTIONS

Dr. WADE. The current technology program could be accelerated to resolve major uncertainties prior to any commitment to on-orbit demonstration or deployment. This could be accomplished to permit a decision by the [deleted] to conduct an on-orbit feasibility demonstration. The cost of such an accelerated technology effort would be [deleted] for fiscal year 1982 through fiscal year 1986, depending on the depth of the effort.

A plan which provides for the earliest on-orbit deployment of a space-based laser weapon is based on the development of a system with brightness of roughly [deleted]. It implicitly accepts the very high risk of attempting to initiate immediately a prototype space laser satellite. Included in the plan is an enhanced technology development program—pertinent only to the [deleted] class system—in an attempt to limit the development risk.

The projected earliest dates for the prototype test and subsequent initial operational capability are [deleted] respectively. Innovative procurement would be required to accomplish an initial operational capability so soon after prototype demonstration. The cost through prototype demonstration would be approximately [deleted]. The prototype demonstration would not include the surveillance, command, and control systems. The capability of such a system would be largely limited to antisatellite missions, with no-growth potential to satisfy more demanding missions such as antiaircraft or ballistic missile defense.

If a commitment were made now to proceed as rapidly as possible—with a high risk—to deploy a more capable space laser weapon system of [deleted] brightness to provide global antiaircraft and ASAT capability, the earliest initial operational capability (IOC) would be [deleted] with full operational capability (FOC) by [deleted]. Development and deployment costs for this [deleted] system designed for an antiaircraft mission, assuming a 10-year life cycle, are estimated to be [deleted].

Cost estimates include R.D.T. & E. and procurement. The higher value includes developing and using a new space launch capability and a new surveillance system and assume [deleted] replacement for laser satellites. The lower value does not include development of launch surveillance and assumes [deleted] life satellites.

A considerable effort is required to further investigate items such as mission effectiveness, survivability, hardness and lethality, surveillance, and command and control in order to determine the military

usefulness of such a system. The risk in cost and schedule involved in developing such a space-based laser weapon system on the specified schedule is very high. A program with more moderate risk would delay full operational capability until well after the year [deleted].

IMPACT ON NATIONAL POLICY

The potential contribution of space-based laser weapons to BMD, air defense, and antisatellite capabilities must be viewed in the light of existing U.S. policies governing the employment and deployment of strategic offensive and defensive forces. The early stage of space-based laser technology development precludes a precise assessment of these weapons. However, the development of these capabilities—consistent with existing treaty obligations—can clearly augment and contribute to our general national policy objective of deterrence.

Thank you, Mr. Chairman.

Senator WARNER. Dr. Wade, before we proceed, I am going to ask staff to acquaint me with the figures that came up yesterday or are coming up today as to these programs.

Do you know the figures associated with these various programs?

Dr. WADE. Yes, sir.

Senator WARNER. Why don't you just give them to me, if you will.

Dr. WADE. The space-based laser system, Mr. Chairman, which you are inquiring about, the fiscal year 1981 dollars are on the order of \$69.5 million. Fiscal year 1982, on the order of \$97.8 million.

Senator WARNER. What is the overlay of President Reagan's request?

Dr. WADE. We expect that the total increase from fiscal year 1981 to fiscal year 1982 will be on the order of \$90 million, of which on the order of \$30 million will be for the space laser program to bring it to \$98 million in fiscal year 1982.

Senator WARNER. What is going to be in President Reagan's budget with regard to BMD?

General TATE. Mr. Chairman, the number on that would be an added \$39 million in fiscal year 1981 and \$90 million in fiscal year 1982. That was for the system technology program.

Senator WARNER. Dr. Zeiberg, do you want to pick up now?

STATEMENT OF DR. SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS)

Dr. ZEIBERG. I would like to describe the applications we see for BMD, tracing our progress from the Safeguard days to where we hope to be toward the end of the decade to give you an overview of why and on what time scale we see these applications becoming feasible.

Let me call out some of the features of the technology deployed at Grand Forks. It had a couple of very special, very large radars, very large nuclear warheads to intercept attacking RV's far out in the exo-atmosphere, and then some small yield warheads that would attack, at short range, anything that leaked through.

PERIMETER ACQUISITION RADAR

The system had some general features which made it unattractive for wide scale deployment. The perimeter acquisition radar (PAR) and the missile site radar (MSR) were very high costs items and very vulnerable.

The next step in the technology led to something called Site Defense, which represented a lower cost and much more feasible approach. The idea was not to try to intercept at great range but rather to intercept close in. We had a very successful program that convinced us we could handle a large number of attacking targets, [deleted]. We could discriminate between real warheads and penetration aids and, most importantly, we achieved a very major reduction in the size of the equipment, and consequently cost, and developed unmanned systems.

These radars could be brought to an operating status from a dormant mode very quickly. We did a certain amount of testing to prove the case. We could throw a single switch and the radar would start operating.

Shown on this next chart [chart deleted] is a picture of the test site out at Kwajalein. The large radar in the background is the MSR, the small one in the foreground is the site defense radar.

The operational version of the MSR would be somewhat more than 200 feet on a side and perhaps 150 feet high. The site defense radar reduced to about 80 feet on a side and perhaps 30 or 40 feet high.

The next step in that technology I showed in my first chart is a concept called low altitude defense (LoAD) which addresses further reduction in size, and therefore cost, and therefore improved operational flexibility. The associated deployment concept also allows us to handle larger threat sizes.

This step reduces radar site from 200 and 150 feet down to the order of 10 to 20 feet.

The fundamental reason is the explosion in microelectronics that has occurred in the last decade. This illustrates one major factor in radar design and construction. This is something called the subarray module. This is a gadget that sits behind the antenna face and radiates the proper amount of energy with the correct timing to point the radar beam in the desired direction. On the right is the subarray that was instrumented with the same technology as the site defense radar about 1970.

There are hundreds of those elements in the total antenna. On the left we see an example of today's technology, something that we would build today. It represents about a 75-percent reduction in weight and volume which results in a 50-percent reduction in cost. Alternately, for the same size, we could put many more in there and therefore handle a more advanced threat.

I recall that the site defense program was something started about 1971, a period when we expected the Soviets to have about [deleted] warheads for the late 1980's. As a result, it has been very necessary to go ahead with a major improvement in technology in order to make the concept workable.

We are in a position to deploy site defense equipment, fully tested at Kwajalein, [deleted]. So it is a nonstarter in that sense.

Senator WARNER. What is the limitation? Why can it only [deleted].

Dr. ZEIBERG. For one reason, it was designed with that operational concept in mind but, more importantly, it is limited because the basic technology that goes into it makes it too expensive to work against larger threats.

Senator WARNER. You can't proliferate it economically?

Dr. ZEIBERG. The cost to proliferate would be enormous and the payoff would be small. Each radar is a critical element in the survivability of the system and the fundamental inability to defend a single radar from a large threat becomes a problem.

By going to the LoADS technology, by reducing the cost and changing the operation somewhat, the concept of defending each site becomes practical. In fact, one could defend every Minuteman silo with LoADS for a lesser amount of money than it would take to defend only a portion with site defense technology.

Let me make sure I don't mislead you. LoADS alone is not adequate to defend Minuteman. I will cover that point later. Something else has to be added to it.

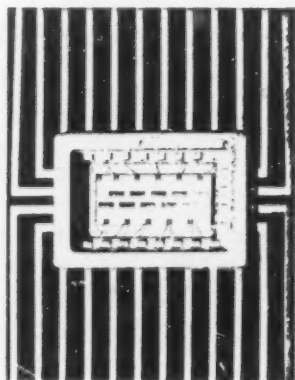
Now, that is the benefit of improving electronics. That has shown up as a major element in BMD equipment development.

In connection with that, basically in parallel, we have developed technology in the long wave infrared field which provides another avenue for exploitation. This technology leads toward a concept which allows us to intercept far out and to launch interceptors which would attack the attacking warhead perhaps [deleted] miles away.

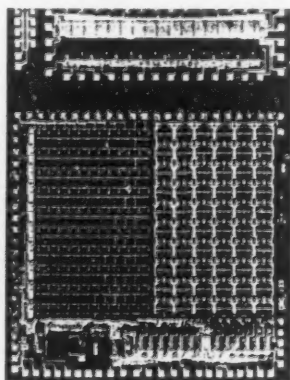
Let me give you some indication of that.

What happened was a discovery that certain kinds of detectors of long-wave length light could be used to detect objects in space. By long-wave length I mean these detectors can detect objects that are basically at room temperature, and they can make the detection at great range. When you try to apply that to the long-range interceptor case, looking at something against a space background which has a low noise or low clutter background, then you can run into a situation where the sensor cannot only detect targets but the accuracy of its subsequent tracking allows us to home on the target. By having a homing system one can drop the idea of a nuclear warhead and go to a nonnuclear warhead.

ARRAY DEVELOPMENT



DISCRETE DETECTOR
ARRAY (1974)



MONOLITHIC ARRAY
(1979)

That opens up an entirely new dimension in BMD. You now can decouple the defense from the general question of nuclear release and delegate responsibility of the defense unit to the local commander rather than making it something that has to go through the President.

This is an illustration of some of the technology that underlies that thought. On the left is a set of detectors that represent 1974 technology. There are 10 detectors, these little light blue elements. The rest is the structure of the chip. These are electrical leads taking out the signal. When the light falls on detectors it creates an electrical current which has to be pulled out on these wires. This is about a half inch square.

Here on the right is an illustration of today's, 1979, technology. There are 250 detectors on the same size element and, equally important, all of the supporting electronics is on there.

To go along with the chip on the left one would need another batch of electronics with the missile elements whereas all that is required is a half inch square chip using 1979 technology.

We have spent a great deal of effort to exploit this.

The idea of seeing targets at great range, detecting them autonomously with an interceptor, tracking them, and then homing on them has been the basis for a very large effort we have conducted during the last 5 years, and will continue to do so.

DESIGNATING OPTICAL TRACKER

A program called the designating optical tracker (DOT) has flown successfully three times now. What we have done is to take a sensor and put it into a sounding rocket and launch it out of the Kwajalein test range against targets launched from Vandenberg Air Force Base to Kwajalein. We have done this against Minuteman operational tests. The sounding rocket flies a vertical trajectory. It has a sensor that uncovers when the Minuteman is somewhere in the vicinity of Hawaii. At ranges close to [deleted] one can detect certain features of the incoming missile train; the spent stages, warheads and so forth. [Deleted.]

We have a recovery system to get the equipment back. It is a very expensive gadget. With the support of the Navy we have been able to recover our equipment.

This chart shows [chart deleted] some other features of that idea where, by combining a sensor capability with a homing logic, we allow a nonnuclear warhead to be used.

Here we show pictures of equipment we have been developing for the nonnuclear interceptor. On the left is shown the upper stage of an interceptor that we are building to fly in a program called the homing overlay experiment (HOE). Up front, the cylindrical device is a detection and homing sensor. Behind it is a fragment warhead. Behind that is a propulsion and guidance element. This gets lofted up by another rocket which is comparable to about half of a Minuteman.

On the upper right is shown something that looks like a pinwheel. That is another kind of warhead we are experimenting with. The pinwheel opens up after the interceptor leaves the atmosphere and flies into the reentry vehicle. The accuracy of the interceptor with the pinwheel has to be such that the object you are attacking is within the

pinwheel radius but no fuel is required. If you have a larger miss distance, the fragment warhead produces a larger pattern but an accurate fuze is required. The fragments are about a half pound in both cases. In the pinwheel case the fragments are spotted along each of the arms.

Senator WARNER. Other than the command and control situation why use a conventional device rather than a nuclear warhead in this system?

Dr. ZEIBERG. You say "why"?

Senator WARNER. Yes; why not use a small nuclear warhead.

Dr. ZEIBERG. We have a much more operational flexibility with a nonnuclear warhead.

Senator WARNER. I understand that.

Dr. ZEIBERG. It looks practical to do. It eliminates the adverse effects produced by a nuclear explosion. There are effects on radars, optical sensors, and LWIR sensors that are relatively adverse. Even though this is occurring above the atmosphere, a lot of the energy gets deposited on top of the atmosphere and it creates disturbances between the defense site and attacking targets. That is disruptive. It causes you to have to disperse the location of any radars so that they look around the effects and it causes you to fly odd trajectories for homing interceptors. They have to fly around the effects. Generally all of those reasons add up to a great interest on our part on the nonnuclear solution.

Senator WARNER. Could they not incorporate in your defensive system some type of nuclear charge that goes up there?

Dr. ZEIBERG. Yes. A fundamental flaw in this kind of system is that it is vulnerable to a very stylized precursor attack which produces the nuclear effects on our radars and our infrared sensors that could disrupt them. This, like all other defense systems, is an action-reaction situation. We have spent considerable effort in learning how to work around those effects. We would obviously at this point, have to live with these effects if they were imposed by the attacker. By the same reason we do not want to impose it on ourselves. Therefore we concentrate on the nonnuclear.

I might add, we are still a long way from doing these kinds of things within the atmosphere. The high speed flight in the atmosphere creates a local environment around the interceptor that is not very congenial to these special sensors. Its hot ionized gases disrupt the ability to make precise tracking measurements and homing so that the size of the warhead is enormous and actually too large to be practical to carry.

Using our intelligence on the design of [deleted] reentry vehicles we have done a series of experiments involving these kinds of nonnuclear warheads.

This is a blowup of what one of the [deleted] pellets can do to a reentry vehicle. [Deleted]. A single [deleted] pellet came in at close to [deleted] which is a typical closing velocity we would expect. It came in about here and rattled around and [deleted]. As you can see [deleted].

We have enough experiments to know that we can get there, we can detect, we can track and we can home. The fundamental question here is whether we can do this in a war environment. We have some very major experiments coming up [deleted] where we will shoot some

of these interceptors against reentry vehicles flown into Kwajalein. Following that we will have to prove that this can be done on a very large scale to assure that we can handle large numbers of targets.

LAYERED DEFENSE

By combining the LoADS technology with a defense system using these homing interceptors, and in fact by putting multiple kill vehicles on our interceptors which is another feasible thing to do, then we have the concept of the layered defense. The first line of defense is long range intercept. It is backed up by LoADS picking up whatever leaks through. The leverage is enormous. You have two leverage factors. One, you have the multiple kill vehicles per interceptor, perhaps 10 or 12. Also, by virtue of the long reach, the defense can be preferential. The attacker does not know which target is defended. He has to structure his attack assuming that everything is uniformly defended at the maximum level. The compounding of these two factors makes this the most critical element of a defense concept we would anticipate in the future. The LoADS becomes the cleanup part of the system.

Dr. ZEIBERG. This shows [chart deleted] layered defense idea as if we were defending a missile site. The concept involves an initial detection with a satellite such as the [deleted] we currently have, which maps out the attack. The probe is a LWIR system similar to what I described for the interceptor but somewhat more capable. It would discriminate the real target from the miscellaneous clutter and penetration aids that come along with the target.

An interceptor would be launched to follow up and would launch one of many kill vehicles at the particular warhead. Whatever would leak through would be picked up by the terminal defense.

We can apply this concept in various forms starting today for one limited application and then on into the future for defense of Minuteman. I will go through that on the next chart.

[Chart deleted.]

Dr. ZEIBERG. This summarizes the applications that we think are realistic and which are described in detail in the report that will be forthcoming very soon. I have broken it up keyed to the idea of the degree of mobility or the way we operate the defense and the way we operate the offense. This is focused on defense of our land-based forces.

FIXED DEFENSE

I will talk first about the fixed defense which defends against fixed targets. There are two things which could be done. One is to defend our capability to conduct attack assessment and launch under attack. The other is to terminally defend the Minuteman fields themselves. I alluded to the latter earlier. It could be done with the site defense technology. We could commit today but, as I noted earlier, it is not worth doing. It cannot handle the threat levels that we foresee for the time period of its deployment, about [deleted].

[Deleted]. In order to make that work we have to wait for the overlay which, in a technology limited case, that is funding unconstrained, might be available [deleted]. The current track of our program, however, adds about 3 or 4 years to that. So it is likely closer to

[deleted]. This technology limited case, by the way, is not something which we could tell you we have a lot of confidence in, with everything working well and no major hitches, under the best of circumstances, we could get there in [deleted]. More likely it would be somewhat later.

Dr. ZEIBERG. What I have in mind here is the way to strengthen our ability to launch under attack by providing a threshold of defense that makes it very clear that an attack is under way. One of the problems in executing or implementing a policy of launch under attack is that the attack assessment system itself could be under attack. You may not know it is happening. Therefore a light attack would trigger you into a massive response. That is a disproportionate response and reduces your options too much.

I will try to show you what will help mitigate some of those problems. First, let me remind you of the time line of an attack on Minuteman. On the bottom is a scale, measured in minutes representing time of flight of attacking ICBM's. On the top line is indicated that within about [deleted].

BALLISTIC MISSILE EARLY WARNING SYSTEM

[Deleted]. The ballistic missile early warning system (BMEWS) radars, one of which is in Greenland, one in the United Kingdom, and one in Alaska, pick up the threats.

[Deleted] what is called EPARCS here, the old PAR radar we built for Safeguard with some extended range where "CS" means command system, picks it up. The impact occurs about [deleted]. The U.S. response would be on the basis of [deleted] and some confidence that it is not just a spurious isolated case, it has to have a threshold. A Presidential conference will be convened. The President and all the major commands and all the other people in the various decision-making processes proceed. About [deleted] before the impact, an emergency action message has to be prepared and transmitted to Minuteman.

There is a response in the launch control facility which is an authentication process. Then it takes [deleted] for everything to fly out.

What I want to focus on is this time window in here where we could have a circumstance where [deleted]. We could be impeded in that process. I will describe a way that will help shore up that capability.

Dr. ZEIBERG. The idea is to defend PAR. The PAR field of view is shown here. [Chart deleted.] The BMEWS in Greenland is shown by the vapor band. The idea is to defend the PAR so that any attack on it has to be above a sufficient threshold to convince us that this is a full-scale attack. We can do that by a combination of long-range interceptors of the sort I described earlier and, in fact, of the sort that we will be testing [deleted]. It does not await a higher technology multiple kill vehicle. It will be done as a direct derivative of what we will be testing [deleted]. That will work well against low numbers of attacking ICBM's.

We will have to add LOADS equipment to cover these lower bands to handle SLBM's that might attack by the back door. There will be

some small fraction of the interceptors which would be the terminal interceptors. These radars are very similar, slightly larger than the ones in the LoADS concept but still a direct scalable version. We could use the existing stockpiled interceptor built for Safeguard. They are in the warehouse. They have to be refurbished at fairly modest cost. As a result, one can get a threshold defense which is well within the state of the art, something to which you could commit today, and have it about [deleted]. This can be done even within the constraints of the ABM treaty, which had a sufficiently high threshold, a hundred interceptors, so that any attempt to attack at this level clearly represents a major attack on the United States. Therefore we have the confidence that execution of the launch under attack option is not in response to a light attack or a defense suppression attack only.

Clearly it is an attack on the total United States.

[Chart deleted.]

Dr. ZEIBERG. That kind of system could be basically called modernization of the site defense program. We could go ahead with a high degree of confidence and have an operational system in the [deleted] time period at a price somewhere in the \$3 billion category.

To go further to more sophisticated systems, the required technology won't be available for some years. Step No. 1 beyond the terminal defense I described earlier is to use a multiple version of the terminal defense in connection with the fixed based ICBM's. In effect, this is making an MPS system out of the defense while keeping the missile defense the same. One could build a few extra sites at each Minuteman site and have a shell game with the defense module. That requires, in order to be effective, the LoADS technology along with the more sophisticated overlay.

Again the time availability. The technology limited deployment date is [deleted] for the LoADS/PAR and [deleted] for the overlay. The current program is [deleted] later than that. Finally, one could make both the defense and the offense mobile. Conceptually that is the way we talk about it. General Tate will describe the specific defense of the MX and the MPS. So you get a compounding of the shell game by causing the offense not to know where either the MX or the defense is. You get enormous leverage out of that.

That is somewhat later in time. [Deleted] would be the likely time period. It is not clear that the overlay is essential for that. That is something we will nail down in the future.

These concepts are detailed further in the report we will submit to you. General Tate will go on to describe the programs supporting all of these ideas and how he is going about implementing and selecting the relevant data to put us in a position to make these employment decisions.

Senator WARNER. General Tate.

STATEMENT OF MAJ. GEN. GRAYSON D. TATE, USA, PROGRAM MANAGER, BALLISTIC MISSILE DEFENSE

General TATE. Mr. Chairman, I will lead off here with a brief description of some of these concepts, elaborate on what Dr. Zeiberg said, and on the programmatic aspects and schedules we might be able to attain.

BMD PROGRAM SCOPE AND ACTIVITIES

Maintain the option to develop and deploy rapidly the most effective BMD system permitted by technology at any future decision point.

Prevent technological surprise by the Soviets through aggressive research into advanced revolutionary technologies.

Support U.S. position in SALT negotiations with visible demonstration of BMD technological superiority.

Support offensive deterrent forces and intelligence assessments.

First, I thought it might be useful to outline what we consider the scope and objectives of the current BMD program to be. This is a program that we have been following over the last several years. You will notice that we are currently maintaining only options for deployment. The ABM treaty allows only a single ABM site. Consequently, while we are not deploying systems, we are maintaining the option and hopefully will be able to do that in a reasonably short time should the President so decide.

I think you are well aware of the fact that our posture for deployment is not as good as we would like to have it today. We also are trying to pursue our own technology and assess that of the Soviets so as to understand what they are capable of doing and not be technologically surprised by some new weapon they might employ. We have supported SALT negotiations. We believe that is a very highly desirable thing. We have evaluated various concepts that have been talked about by both sides. We do support our strategic offensive systems.

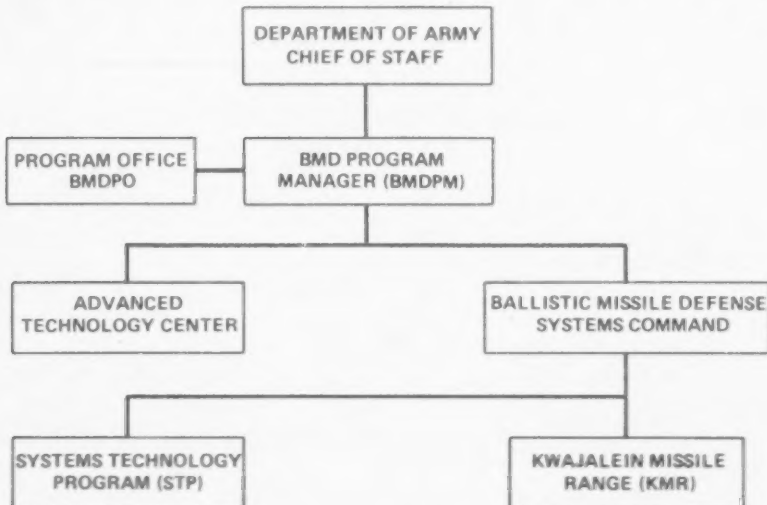
We do that first of all by the fact that we manage Kwajalein Missile Range in the Pacific where all the impacts take place for R. & D. and any operational tests of our ICBM's. We do participate in various studies and intelligence activities looking to both offensive and defensive systems.

Just a couple of words about our organization. The BMD organization is unique in the fact that we are not a part of DARCOM, Development of the U.S. Army Materiel Development and Readiness Command.



CURRENT BMD ORGANIZATION

X. 6005.29-15



As program manager I report directly to the Chief of Staff of the Army. We have here in Washington a small staff of about 25 people who assist in local liaison with the services, with the Congress, the Department of the Interior and Department of Energy, and so forth. Most of the organization, however, is located in Huntsville. Our BMD organization today is a far cry from that which existed in the early seventies when we had 5,000 or 6,000 people working in ballistic missile defense. Today, we are authorized 522. It is not a large organization. In Huntsville we have the Advanced Technology Center, 120 people, a very highly technical organization. They manage over 300 contracts to work and manage the advanced technology program. This takes all of the new technology, whether it be data processing, missiles, propellants, guidance systems, all that sort of thing, and tries to mature that technology so that it can be handed off at the appropriate time to the Systems Technology Program Office which is a part of the Ballistic Missile Defense System Command.

The people in this System Technology Program Office manage the systems technology program. They design various types of field experiments, field tests, advanced simulations and proposed systems concepts which are tested later on at Kwajalein Missile Range (KMR). We manage that national range activity. I might mention at the range itself we only have 50 Government personnel—20 military, 30 civilians. KMR is almost entirely a contractor operation, 2,000 civilian contractors do most of the work out there.

Senator WARNER. Basically what sort of contract structure do you have? Cost plus? There is no competitive bidding to speak of, is there?

General TATE. Yes, sir, we do compete. Those contracts were competed a number of years ago. We have one large contractor, our base support contractor, Global Associates. They do the maintenance of the buildings, generate electricity, and those sort of things. We also have technical support contractor Kentron. Chemtron is our technical support contractor. That contract was completed in 1976.

Senator WARNER. You renew it each year?

General TATE. No, sir. It was originally a 3-year contract with renewable options. A couple of those options have been used. I have just completed a reevaluation of that tech support contract to see whether or not it should be competed this year and have decided not to compete it because it could interfere with some of the ongoing programs and cause technical risks to an unacceptable degree.

Senator WARNER. Who is watching the profit margins?

General TATE. I am. We manage the contract. We have the contracting officer. We evaluate that on a quarterly basis to determine what fees they get. It is on a sliding scale according to their performance.

Senator WARNER. You think the profits are reasonable on these contracts?

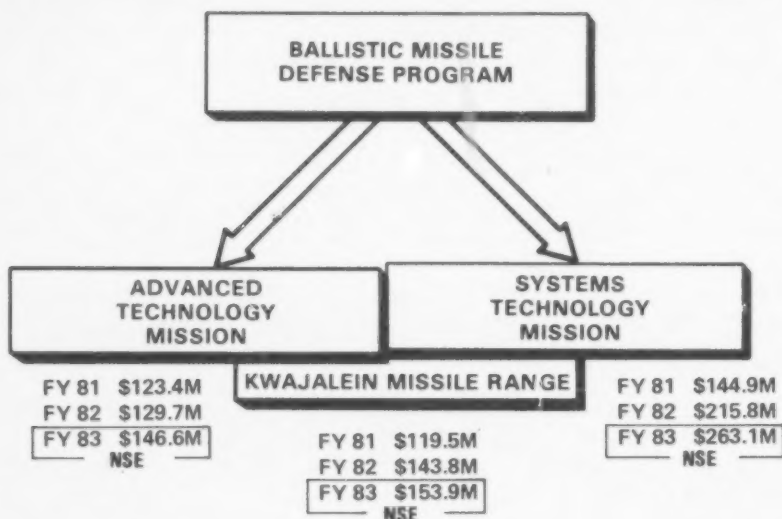
General TATE. Yes, sir, I do.

The way the BMD program works is that the Advanced Technology Center explores different technology areas. As a useful technology matures, it is fed into the systems technology program and they come up with field tests for evaluating the various theories. An example is the designating optical tracker. They also feed back technology requirements. Most of this technology comes together at Kwajalein where both programs do some experimental work.

BMD

PROGRAM STRUCTURE

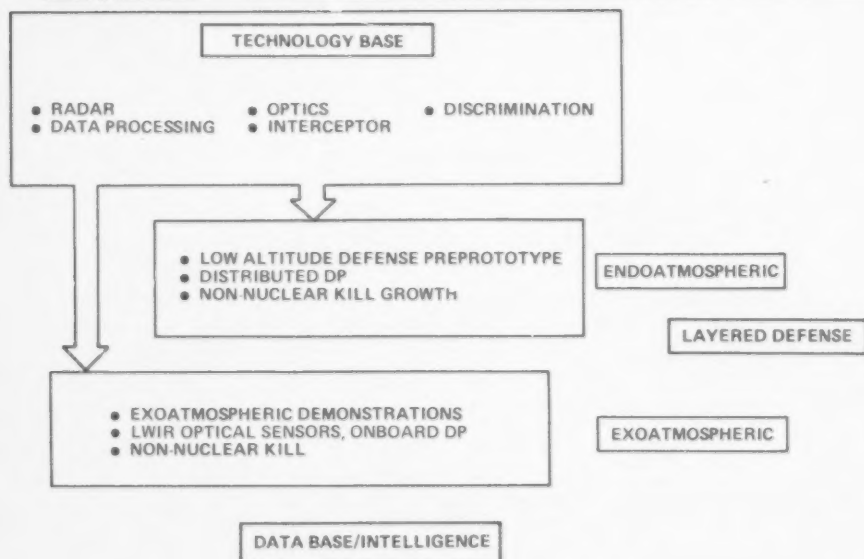
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We currently have three budget items, the advanced and systems technology line items and a separate line item for the Kwajalein Missile Range. You see the number here for the advanced technology program that represents the Carter administration budget that was submitted back in January. As was mentioned earlier, this program in the new Reagan administration budget remains the same. The systems technology program, however, is increased by \$39 million in 1981 and \$90 million in 1982 in order to allow us to accelerate some of our ongoing programs.

BMD

MAJOR PROGRAM THRUSTS



The technology base program which exists in our advanced technology program works all those areas listed as well as some others. In order to study the very latest techniques in this country—microelectronics, new propellants and so forth—they are fed down into both the endoatmospheric program and into our exoatmospheric work. Of course, those, put together, do form the layered defense concept.

We also have a considerable effort that looks at our total data base to make certain that we can discriminate between an RV and some other object and we do have some money devoted to studying the intelligence effort.

I would like to describe the two primary program thrusts, low altitude defense [LoADS] system and layered defense. First I will talk about LoADS.

As Dr. Zeiberg described to you, we have been hard at work on ballistic missile defense systems since 1955. The work that came out of Safeguard and the site defense programs as well as other work in our advanced systems technology program, now allows us to apply that technology to this new LoADS system. Thus, we can proceed with a high degree of confidence at relatively low technical risk and actually develop these components as planned.

The LoADS system consists of a small radar and associated data processing system and [deleted] LoADS [deleted] located in one defense unit that would fit in one MX shelter. The LoADS interceptor is a little more than half as large as the Sprint missile that was part of the Safeguard system. It is a very high acceleration, high velocity missile that accelerates to [deleted]. It has a small nuclear warhead with a yield on the order of [deleted] in order to assure kill of the target. It is an inertially guided system.

I would like to give you a size comparison. There is about a 6-foot aperture on the LoADS radar whereas on these radar systems—Safeguard and site defense we are talking of an aperture of 13 or 14 feet. LoADS uses the latest techniques in microelectronics in order to shrink the size and volume of the supporting data processing system.

We are developing these components of a LoADS system in a generic sense so that we could take those components and configure them in different ways to perform different missions. One of the two primary concepts that we are looking at today is a system concept which will be appropriate for protecting MX in a multiple protective shelter. LoADS also might be used as the underlay to a layered defense system for protecting our fixed ICBM's, such as the existing Minuteman.

We are proceeding, with what we feel is low risk technology. We have demonstrated endoatmospheric defense with both Safeguard and site defense. Our current baseline funding has had us on a schedule that would permit an [deleted]. If the new funds requested today from Congress are approved, we should be able to speed that up [deleted] so that we can be in a posture to reach initial operational capability in [deleted].

Senator WARNER. General, in the various studies underway in connection with the alternative launching systems of the MX, are we factoring in the required ground space and so forth for a BMD system?

General TATE. Ground space?

Senator WARNER. Yes. How much ground will we preempt for these launch sites and so forth?

Dr. ZEIBERG. The integration of defense with the MX weapon system which is being considered in some detail. General Tate has established a relationship with the Air Force to effect that. I believe he will describe it in some detail as he goes along.

Senator WARNER. Thank you.

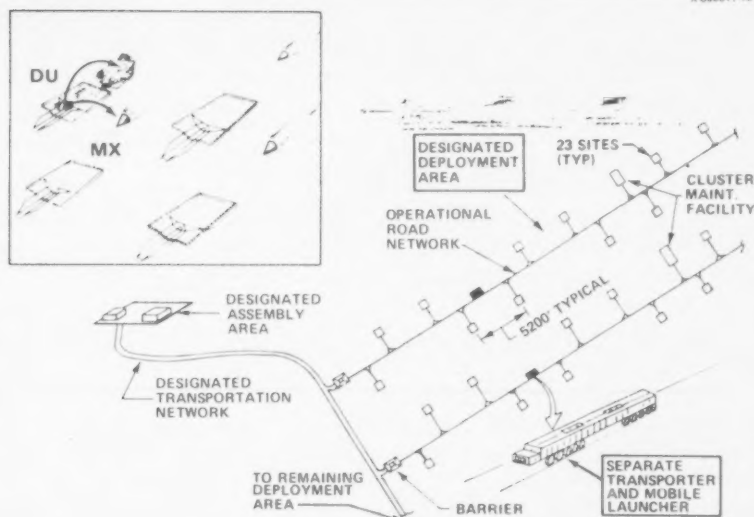
DEFENDING SHELTER WITH MX MISSILE

General TATE. If I might go back to this basing thing, we will defend only that shelter that contains the MX. We will not defend the empty shelters. The LoADS defense unit is located in a nearby shelter which otherwise would be empty so that we do not have to include the cost of a basing system for LoADS. We use existing MX shelters. This is the configuration that we are talking about. I will show you another picture of this in a moment and elaborate on that.

BMD

MX DEFENSE

X-800611-10



I believe you are familiar with the MX concept. Unless you have some questions I will not describe that in detail other than to say that each of these linear arrays with 23 or so shelters has 1 MX missile, carried on this very large vehicle. We would plan to [deleted].

We only protect that one shelter that contains the MX system although we have enough missiles for self protection should the LoADS unit be attacked first. So, that we can survive to protect the MX.

Senator WARNER. What is the maximum distance you could deploy this system from the MX site?

General TATE. We have studies ongoing now to assess that further. We know that there is a considerable area. For example, assume that this direction is north, toward the attack: The MX, for example, could be in this shelter. Now, there is a fairly sizable area in which we could deploy a LoADS system and still provide a suitable defense. De-

pending on the specific geographic layout of individual shelters, we might be able to place the LoADS defense unit in up to [deleted] of those shelters. We are looking now at tradeoffs to see how much the performance of the LoADS system might be degraded as a function of distance from the MX shelter. But there is a sizable area in which we could deploy.

LOW ALTITUDE DEFENSE PREPROTOTYPE DEMONSTRATION

OBJECTIVES

Develop and demonstrate a LoAD system.

Reduce deployment leadtime.

[Deleted.]

Hedge for unconstrained threat.

PROGRAM PLAN

Definition and contracting in fiscal year 1980.

Program now underway.

Contractor team selected, including prime contractor.

Preprototype demonstration complete by [deleted].

Maintain capability to accelerate program—including IOC.

Increased Army participation.

The objectives of the preprototype demonstration (PPD) of this LoADS technology is to develop and demonstrate the generic system which might be used for either of the employments that I just mentioned and in order to reduce the deployment leadtime so that when this demonstration is complete we can be in a posture to deploy that system within [deleted].

If we can in fact do that, we would be able to provide a hedge for the United States for the protection of MX assets if the Soviet threat continues to grow in an unconstrained manner, much larger than talked about in SALT II, for example. The way we are doing this is that during the past year we have gone about a systems definition. We have set up our contracting structure for this program. The program is now fully underway and funded. We have selected our prime contractor which will be the McDonnell-Douglas-Astronautics Corp. We have also selected the subcontractors for the radar, data processor, and the missile. We are currently proceeding on a path that will allow us to complete this preprototype demonstration in [deleted] at which point we will be [deleted].

As I mentioned previously, with the additional money requested today, we can accelerate that [deleted].

Now we want to get other elements of the Army more actively involved. As I believe you are aware, other elements of the Army, since the deactivation of Safeguard in 1976, have been not too actively involved. This program has been in a technology state and really primarily involving only the BMD organization. We are trying to change that now.

[Chart deleted.]

This is the program that is currently approved and the one within the Carter administration budget. It indicates that we have completed this system definition process. We will be moving toward a systems design review about [deleted]. We will proceed with the design and fabrication of the system, subsystems test at White Sands in 1986, all systems tests in Kwajalein Missile Range in [deleted].

The moneys currently programed for completion of this preprototype demonstration is about \$1.5 billion.

The accelerated program, which we have structured in response to requests from both OSD and the Congress, would allow us to complete this program [deleted] earlier, in [deleted] and we can do it for somewhat less money since we don't have to fund with inflated dollars in the out-years. It is a more efficient program. So we can do this demonstration for a couple of hundred million dollars less and in fact the total R.D.T. & E. cost involved including engineering development would be about \$300 million less than that on the current baseline program.

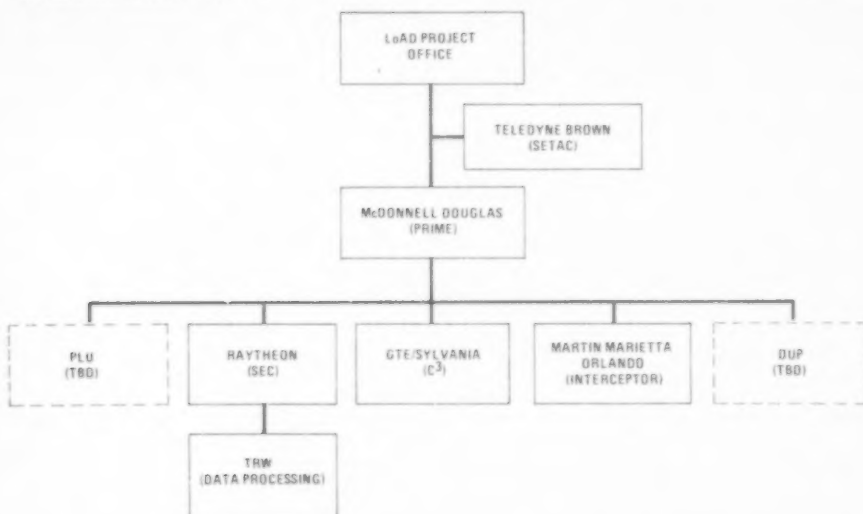
We think it makes a lot of sense to move into this accelerated program.



LOAD CONTRACTOR STRUCTURE

SYSTEMS TECHNOLOGY PROGRAM

107022-602



For our contract structure exists today for LoADS, the program is being managed by the LoADS Project Office, part of the Ballistic Missile Defense Systems Command at Huntsville. McDonnell-Douglas is the prime contractor. Martin-Marietta is the sub for the interceptor. Raytheon is the subcontractor for what we call the system engagement controller—the radar and data processor. TRW is the subcontractor to Raytheon for the data processors. We are planning to use GE/Sylvania for C³ contractor. These are the same people who are performing that function for the MX program.

We think it makes a lot of sense to do that. We are also beginning to define the work that is necessary for us to do for preservation of location uncertainty [PLU]. The PLU problem is certainly a challenging one. We will be working with many of the same contractors that MX is currently using.

The same applies here to the defense unit platform, the vehicle which will actually carry this radar, data processor, and missile and be inserted into the shelter.

LOAD PPD TECHNICAL ISSUES

Nuclear hardness; intercept lethality; MX compatibility; Pen aids and tactics.

Of the technical issues that we face right now, these are the primary ones. The [deleted] that we have to overcome. With the current concept for the MX where you have multiple bursts on the order of [deleted] yield going off in the vicinity there is a nuclear environment created which is more severe than anyone has imagined for the operation of a defensive unit. It is [deleted].

However, our investigations at this point indicate to us that it is certainly [deleted]. We are proceeding with that.

A question has been raised on the lethality of the interceptor. That is, can we come close enough in this severe nuclear environment for a small nuclear warhead to be able to kill the reentry vehicles. We believe that it can. This is going to require a very hard interceptor, considerably harder to nuclear effect than the Sprint used in the nuclear Safeguard.

We are proceeding with that missile now. There have been some people who question the ability of the LoADS system to get close enough to an incoming RV to destroy it with a small nuclear warhead. We believe we can do that and we are currently looking at system updates while the missile is flying out in order that it can achieve the necessary accuracy.

The compatibility with MX certainly is a challenge. MX is a very large system. MX is in full-scale engineering development while LoADS is in a preprototype demonstration. Nevertheless, we have an effective means of coordination with the Air Force which I will describe in more detail in subsequent slides.

We are looking at the design of the shelter, the whole design of the system and making certain that all of its interfaces are sufficiently tied together that LoADS would remain a viable option for the protection of the MX should it be so ordered. With regard to penetration aids and tactics we are looking at a variety of penetration aids including electronic countermeasures, maneuvering reentry vehicles, decoys, and the like. We will continue to look at those during our development program to make certain that the LoADS system can sufficiently deal with them. We are also looking at various tactics that the Soviets might use. For example, whether they attack from west to east or east to west or north to south, south to north, using certain types of a variety of weapons and all those different sorts of things.

LOADS INTERFACE COORDINATION

Extensive coordination with the Air Force:

SEC. Air Force.
Chief of Staff.
Air Staff.
AFTEC.
Ballistic Missile Office.
SAC.
Norad.
FTD.
AFLC.
AFSC.

Other Army agencies and commands:

TRADOC.
DARCOM.
OTEA.
USANCA.
INSCOM.

Intelligence agencies :

CIA.

DIA.

Air Force.

Navy.

Army.

Defense Nuclear Agency.

JCS.

Defense Science Board.

Department of Energy.

State/ACDA.

FEMA.

As far as interface coordination is concerned. We have had a lot of it during the past year. We have been talking to all the agencies listed here. Within the Air Force we have talked to many different elements of the Air Force. The primary one is with the ballistic missile office (the SPO for MX) out at Norton Air Force Base. We are also working with the AFTEC people at Kirtland AFB on preservation of location uncertainty. We have briefed people in the Secretariat, Air Staff, and Chief of Staff Offices.

We have been to SAC, Norad, Foreign Technology Division, Air Force Logistics and Systems Command.

Within the Army we are in constant touch with all of those agencies indicated. In fact just this past week a letter has been signed out by the Department of the Army to the Training and Doctrine Command. We will be convening a committee within the next 30 to 40 days to get together with the Air Force, specifically with BMO, SAC and the Air Force Technical Evaluation Center at Kirtland Air Force Base, to begin working the organizational and operational concepts for LoAD so that it will be totally compatible with MX in whatever basing mode is approved.

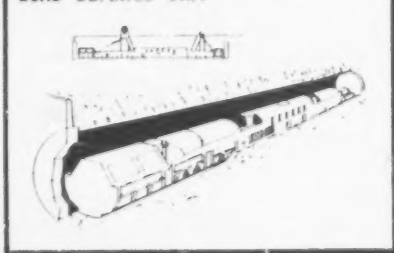
We are working with all of these intelligence agencies plus these other agencies indicated on the right here. They have all had considerable interest in this LoAD system.

BMD MX COMPATABILITY: INTERFACE/PLU/BREAKOUT

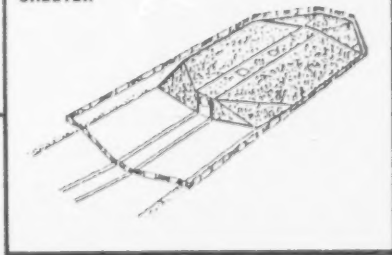
SYSTEMS TECHNOLOGY PROGRAM

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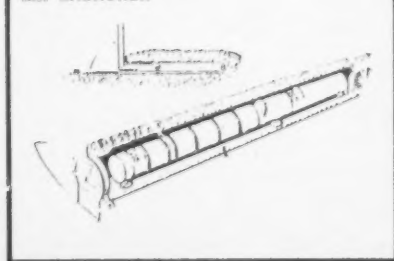
LoAD DEFENSE UNIT



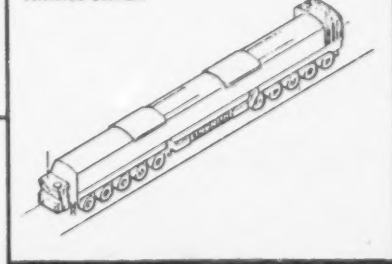
SHELTER



MX LAUNCHER



TRANSPORTER



A key issue is the compatibility interfaces. For example, this shelter is now being designed for the MX. Its design will determine the constraint of volume that we have to live with. It is different for the shelter and for this transporter vehicle on which the LoAD module will be mounted. While on this vehicle or while in the shelter, the LoADS system must [deleted].

Senator WARNER. How do you handle arms control? Will you cover that?

General TATE. With regard to this deployment?

Senator WARNER. Yes. If you are going to integrate a system that looks so much like MX, how do we handle the verification in arms control?

ARMS CONTROL

General TATE. Let me point out here on the shelter you see the SALT verification ports which were a part of the design, assuming we were going to have a SALT II Treaty. With those SALT ports removed you would be able to look down into the shelter and discern whether there was an MX missile or a LoAD defense unit present.

Dr. ZEIBERG. May I add some points to that? The fundamental and most important verification procedure for MX, with or without the defense adjunct, would be at the assembly area where the equipment is shipped from the various factories that support the program and these large missile modules are assembled, and the defense units would be assembled. That is a time-consuming process that typically takes a couple of weeks. That would be done out in the open and would be available for the Soviet observation satellites to see.

Going one step further and putting in these ports in the roof of the shelter is somewhat debatable in terms of its utility and potential adverse effect on the shelter design. It weakens the structure. It is not clear to me that those ports really contribute very much, now that we have done a lot of testing simulating what an observation satellite could see through those ports. That question is under debate now and we will resolve the need for those ports as part of this general review of MX. I don't think we should accept it as a given right now. We have reopened the question of whether it is useful. The main thrust then is doing the assembly at the assembly area in a manner which is verifiable. That is in the spirit of verification procedures for submarines. You watch submarines under construction at a shipyard and therefore you know that so many submarines are built.

BMD/BMO INTERFACE MOA

Defines purpose: Define risk, cost effective solutions and interrelated milestones.

States responsibilities:

BMO Commander.

BMD program manager.

Cochairman.

Provides for establishing:

Steering group/secretariat.

Points-of-contacts.

Action plan.

ICWG membership.

Requires:

"Continuous" or "appropriate" POC meetings.

Quarterly steering group meetings.

Semiannual commander's review.

General TATE. I thought it might be useful to you to talk about the interface with the Ballistic Missile Office at Norton Air Force Base. We currently have an interface document that I signed with the commander of BMO several months ago that established that we would coordinate our programs in a specific way, that we would define the risk, cost-effective solutions, set how our milestones interface and relate, and make certain that we remain a viable option for the defense of MX. That document sets specific responsibilities for the BMO, for the BMD organization. Currently General McCartney and I are cochairmen of this group. It provides for a steering group, secretariat, points of contact, action plan and working group membership to study the problems of how these systems will interface.

It requires continuous appropriate meetings. We have quarterly meetings of the steering group cochaired again by members of the BMD and Ballistic Missile Office. Semiannually General McCartney and I meet with our staffs—and more frequently if required—to approve whatever procedures have been established. We had an all-day meeting a few weeks ago, a successful one, and we have a good spirit of cooperation.

BMD

SYSTEMS TECHNOLOGY PROGRAM

MX COMPATIBILITY

RL-80113-11

DESIGN AREA	MANAGEMENT APPROACH
• INTERFACE	• JOINTLY ESTABLISH OPERATING ENVELOPES • CONFORM TO MX OPERATIONS CONCEPTS • DEFINE INTERFACE SPEC
• PRESERVATION OF LOCATION UNCERTAINTY	• ESTABLISH COMPATIBLE SIGNATURE REQUIREMENTS • CONTROL SIGNATURE ALLOCATION • COMPONENT PLU TESTS • PPD PHASE II DEMONSTRATION
• BREAKOUT	• INSENSITIVITY TO MX SHELTER DESIGN • PPD PHASE I DEMONSTRATION TESTS • PPD PHASE II SYSTEM TEST

Looking at this MX compatibility, we are working at establishing operating envelopes which are satisfactory to both systems; like for example, the volume within the transport vehicle which must contain either the MX or the LoADS defense unit. We are going to design an operational concept for LoADS that is mutually compatible with whatever system design the Air Force finalizes for the MX. Obviously we are going to have to do that. That is why we are going to convene the joint Army/Air Force group next month to get started on that.

With regard to the preservation of location uncertainty, we are looking at [deleted]. For example, we will do tests on the various components from a PLU standpoint. During the phase II of our pre-prototype demonstration we will have to have a full-scale demonstration of this PLU and verify that it is, in fact, good.

We are looking at the breakout technology. LoADS will break out through the top of the shelter prior to engagement while the MX

system will not. We have to verify that the shelters' design is satisfactory and we will be going through demonstration tests and system tests including breakout during the development program.

LOADS PROGRAM SUMMARY

Technology base is established.

Contractor structure is in place.

LoADS interface:

USAF (BMO, SAC, AFTEC).

DOE.

DNA.

Considerations of program acceleration:

Better balanced program.

Earlier availability.

Lower cost.

So, summarizing for the LoADS program, we do have a tech base. We have a contractor structure defined, interface defined with all of the agencies including the Department of Energy on the warhead. We believe that an accelerated program such as that being proposed in the budget today will give us a better balanced program. It will move along more quickly and allow us to reduce risk. It will give us earlier availability for the system and it will do it at a lower total cost which seems to make a lot of sense.

VERTICAL VERSUS HORIZONTAL BASING

It does require some additional money, however, in the early years.

Senator WARNER. Before you leave that system, what does your analysis show with respect to the type of basing mode, namely vertical versus horizontal, relative advantage to one system?

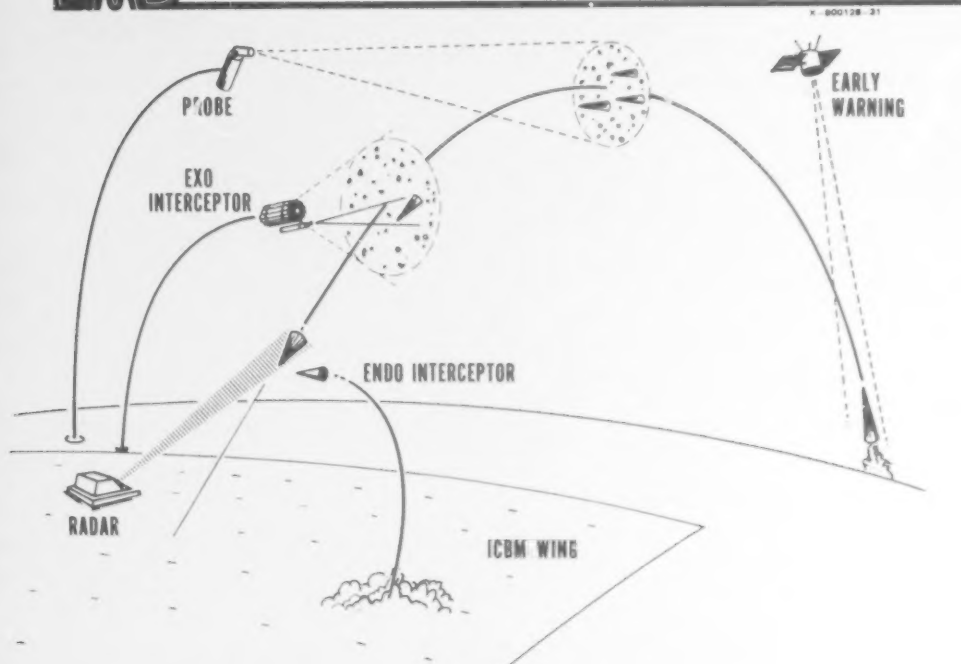
General TATE. Most of our work during the past 12 to 18 months has been in regard to the horizontal MPS basing mode for MX. With it we don't have to build new shelters. We use the existing shelters with their communications and power, et cetera. We can package the entire LoADS defense unit on a single vehicle and insert it in the shelter.

If we go to a vertical MPS mode we would probably have to [deleted]. This complicates things a little bit. It might make some difference in the cost although we don't think it will have a major cost impact. The system certainly could operate in a vertical mode but it is a little simpler if we don't. It is simpler for a horizontal mode.

Dr. ZEIBERG. The vertical system complicates the preservation of the location uncertainty of the defense units and the MX because you now have [deleted] that have to look the same and [deleted]. That becomes an operational question because any breakdown in the security will likely occur, not because of technical invention—we can stay ahead of that game—but because of breakdowns in operation. Therefore, minimizing the number of steps, the number of people, and so on is always beneficial.

Therefore, there is some distinct benefit from an operational perspective in being horizontal.

General TATE. I will move on to our layered defense program thrust. Dr. Zeiberg had this slide up. Let me elaborate on a number of points.

BMD**LAYERED DEFENSE SYSTEM**

The probe vehicle we would launch once we were informed that a major attack was underway would go to an altitude of [deleted]. It would scan a field of view which ICBM's would have to pass. If we think in terms of a large attack of [deleted] reentry vehicles with perhaps [deleted] other objects—decoys, balloons, expended third stages, bus vehicles and so forth—that probe has to be capable first of detecting and discriminating which are the RV's and which are not and predicting the point in CONUS where those reentry vehicles would impact.

We are able to do that today we believe with the very high capacity data processor that we can now put on board a missile. We have technology, for example, under way now using the latest microelectronic techniques that will allow us in a 2-cubic-foot package to put a computer on that probe that would be capable of handling about [deleted] instructions per second. You need that kind of capacity in order to handle these very large threats. Anyway, having determined where those would impact we would launch exoatmospheric interceptors in such a way that we optimize the defense and allow the multiple kill devices from each interceptor to take a particular piece of the sky and efficiently engage one of the [deleted].

Since the probe is able to watch this whole attack evolve we can see from that vantage point where he is ganging up on us—perhaps one Minuteman field more than another. We can allocate our defenses in an optimum manner and whatever leaks through of course we will pick up with the low altitude defense system.

With regard to the overlay, Dr. Zeiberg mentioned that the technology is less mature and our current programs have as their objective the maturing of this technology and the validation that it in fact

will work. We recognize that this is a high technology area and we have to put our money where our mouth is and prove that these concepts will actually work in practice. Our current baseline funding that we have approved today is not adequate to tie together all the pieces of this overlay technology.

We are pursuing a number of pieces a couple of which I will describe here in subsequent slides. But we do not have funding to tie the overlay system concept all together. We need to do that in order to demonstrate the whole concept. Today's programs [deleted] without doing some additional work, but we believe that with enhanced funding we can have this system available by about [deleted]. We would certainly like to do that.

EXOATMOSPHERIC DEVELOPMENT ISSUES

Can you see it? Ability of onboard LWIR sensors to perform detection, discrimination, designation (D²) functions.

Can you get close enough? Ability to home-on the target and achieve miss distances compatible with nonnuclear kill.

Can you kill it? Ability to fuze and deploy a nonnuclear warhead to kill a target reentry vehicle with high confidence.

The issues for an exoatmospheric system as you can see the threat, can you get close enough to kill it and can you actually kill it? I believe the slide that Dr. Zeiberg showed you is fairly convincing that a [deleted] at the closing velocity we are talking about will kill an RV if it hits it. We have programs designed to demonstrate that in about [deleted].

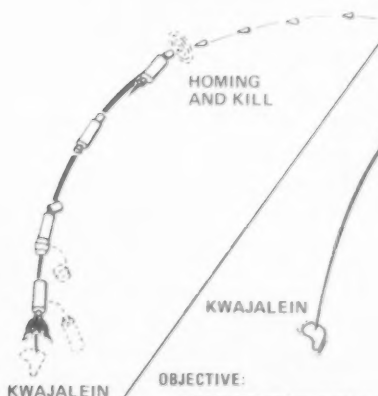
BMD

EXOATMOSPHERIC EXPERIMENTS

HOMING OVERLAY EXPERIMENT (HOE)

OBJECTIVE:

DEMONSTRATE EXOATMOSPHERIC
HOMING AND NONNUCLEAR KILL



KWJALEIN

OBJECTIVE:

DEMONSTRATE THE FEASIBILITY OF OPTICS FOR
BMD DETECTION, DISCRIMINATION, AND
DESIGNATION

FORWARD ACQUISITION SENSOR SYSTEM (FASS)

OBJECTIVE:

DEMONSTRATE THE USE OF LONG-RANGE
MISSILE-BORNE ACQUISITION SENSOR
REQUIRED FOR BMD AND EARLY WARN-
ING APPLICATIONS

DESIGNATING
OPTICAL
TRACKER (DOT)



The experiments under way today in our exo program are three in number. These two are flight test programs. This one is a ground test and a very advanced simulation program. The forward acquisition

sensor is the exoatmospheric probe vehicle I mentioned previously. It has worked in ground test (with simulation) to prove that we can handle these very large numbers of objects, track them and be able to discriminate against them.

The designating optical tracking program is further validating our ability to detect, discriminate, and designate those targets. We have had three successful flights in a program of five flights. The next one is coming up in [deleted]. Each one is getting more complicated. We have a homing overlay experiment which is under contract with Lockheed Missiles & Space Corp. that will lead to our [deleted].

I thought it might be useful also to mention the systems technology reentry program flight No. 3. It is the most complicated and comprehensive experiment we ever conducted out at Kwajalein Missile Range. We launched a Minuteman from Vandenberg. That Minuteman contained a reentry vehicle [deleted]. We also looked at it with our systems technology radar at Kwajalein. That was the final test of that radar in its test program

We had all our [deleted]. All in all, it was a highly successful test. Many people have said that the probability of pulling it off was less than 50 percent. It went off very, very smoothly, much to our delight.

[Chart deleted.]

This is a picture of the [deleted].

This is what it looked like after it was recovered. [Deleted.]

Our current overlay funding is shown here: \$92 million this year, increasing somewhat but not very much over the next several years. It is allowing us to address these very specific areas but it does not give us funds to tie it all together in a systems test. We need to do that very badly. In order to do that we will need some additional money. It looks like a critical mass of funding is something on the order of \$200 million a year. It will require money roughly in that magnitude in order to allow us to do all the work that is required to go into an engineering development program about [deleted].

If we do that we can get to an [deleted] possibly a little bit sooner. Such a system will be very capable in handling these large threats. We are very anxious of course, to move out on this work, but currently this is the only funding that we have. So we [deleted].

[Chart deleted.]

The issues on overlay laid out here. We long wave infrared optical homing. That is a program where we will have our [deleted]. That program is on schedule. We are quite confident [deleted].

We have a [deleted]. The goodness of the systems is a function of how well we do [deleted]. We are looking also at these other items although we have relatively little funding going into this right now. We need to look very thoroughly at this command and control problem. [Deleted] and we have to be getting money into a program for mass production of these optical sensors because right now we [deleted].

Just a few words about our advanced technology. In that program, which backs up all of our other programs we are [deleted].

The next generation technology which should be available about [deleted] will allow us to have on board the missile, in very small

volume, a data processing capability of between [deleted]. That is the way the state of the art is coming along.

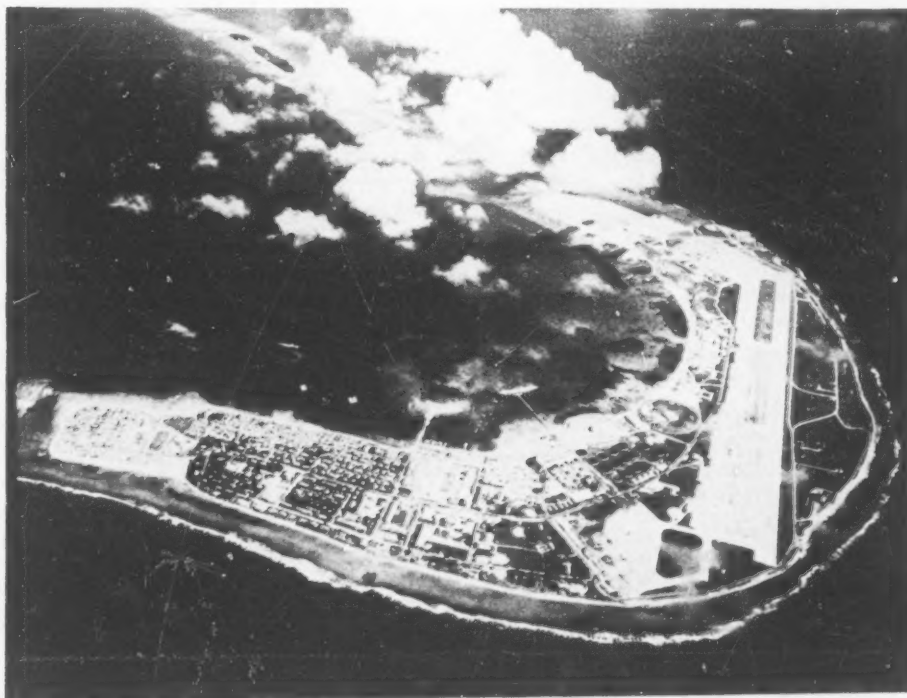
[Chart deleted.]

This is a model of the miniature [deleted] vehicle which was developed in the BMD program and which has now been [deleted].

We have picked up on that technology in the BMD program and currently have under development with Vought in Dallas, a [deleted]. This device is perhaps [deleted]. Because of the small size of this vehicle you would be able to [deleted].

KWAJALEIN

Just a couple of words about Kwajalein. We support both the strategic defensive and offensive systems out there. [Deleted]. We can see into space and track Soviet systems. One of those large radars is currently undergoing modification for \$11 million. [Deleted.] It will be operational [deleted].



At Kwajalein where our 3,000 or so people live, these are the housing areas, technical areas, and scattered along the lagoon we have various radars used as sensors for detecting incoming ICBM shots and for range safety, communications and so forth.

Up the atoll a few miles we have Meck Island which is the location of the large radar that Dr. Zeiberg showed you earlier, that was used for the research and development program in Safeguard. It is also where our systems technology radar was located. This is a point at which we will be [deleted].

[Deleted] to be a part of the [deleted]. In this complex we have a concentration of sensors; both optics, radar, laser radar. It is an accumulation of the best sensors anywhere in the world for providing for tracking and diagnosing particular information for both offensive and defensive strategic weapons.

BMD PROGRAM SUMMARY

BMD is a viable strategic option.

Endoatmospheric defense technology is mature; most has been demonstrated.

Exoatmospheric defense technology is less mature; needs to be demonstrated in a system context.

BMD enhances survivability and strategic stability.

BMD can be accelerated; technology base is established; contractor structure is in place; interfaces with USAF, DNA, and DOE are established.

Summarizing what I have said, we believe that BMD is a viable strategic option today for the United States. We need to go ahead and mature this technology and demonstrate those elements that have not already been demonstrated. The endoatmospheric technology is mature. We have a very high confidence and we feel it is a low risk program. The exotechnology is not quite so mature and needs to be demonstrated in a system context to increase people's confidence that it will work. We believe it will work but we need to demonstrate that it can.

BMD would enhance the survivability of our deployed ICBM system and we believe under certain circumstances can contribute to strategic stability. Our programs can be accelerated. The tech base is established. We have our contractor in place, our interfaces have been established and defined. We believe that now is the time to begin an active effort to accelerate these programs so that they can be available more quickly.

Sir, that completes the presentation that I wish to make.

Senator WARNER. Senator Jackson?

SAFEGUARD SYSTEM

Senator JACKSON. Mr. Chairman, I came in late. I would like to ask the General if it is not too much trouble for just a quick summary of the old Safeguard system, the comparison with Spartan with the new one and Sprint. I was involved in that fight which we got through the Senate by one vote. I can't forget it. Could you just quickly say what the system will do as compared with the Safeguard systems?

General TATE. Sir, as you recall there were two radars with Safeguard, one was an early warning and attack assessment kind of radar, the other was a missile site radar (MSR). The MSR was one radar on which a large number of missiles were dependent. The radar became the most vulnerable element. The idea was that if the Soviet wished to concentrate by pouring enough RV's at that radar, sooner or later they would get it, and all your interceptors couldn't be used.

The difference in LoADS is that we have not only gotten a lot smaller and a lot cheaper but we can proliferate it. We can actually afford to devote a defense unit consisting of radar data processor and [deleted] interceptor [deleted] to protect each MX missile in this multiple protective shelter system. And since we are deceptively based—that is,

the Soviets don't know in which one of these shelters the LoADS or MX is located, we can then, by our own choosing, defend only those things that we need to defend—namely, that shelter containing the MX. This gives us a tremendous leverage and advantage in that we don't have to defend the empty shelters and the Soviets don't know where we are, so it is difficult for them to try to target the LoADS system.

This is a useful comparison. The Safeguard MSR is a very large radar 230 feet on the side. Then we went to site defense. This was the system specifically designed for defense of Minuteman. This radar building out at Kwajalein was 80 feet on a side. The LoADS radar we are talking about today is an X band radar and can be packaged in a space 9 feet in diameter and 20 feet or so long and carried on the same type transport vehicle that carries the MX.

Senator JACKSON. You can move it right along to whatever place it is going to be?

General TATE. Yes. It will play the shell game against that array of shelters.

Senator JACKSON. It is an adjunct to your offensive system?

General TATE. Yes, sir. Likewise the missile that we are going to use is about 17 feet long compared to 55 feet for the Spartan. Spartan had a [deleted]. We are talking about possibly an [deleted]. Even Sprint was 27 feet tall. As far as data processing, we had rooms of cabinets lined up. It came out to something like 37 cabinets; 4,400 cubic feet. We went to site defense which was much smaller, about 28 smaller cabinets. Today LoADS, using the latest microelectronic technology, for roughly the same computer capacity, can be put in a few boxes, I believe that run like 20 cubic feet compared to 4,400 cubic feet for Safeguard. It is a tremendous amount of progress in the new electronics technology.

Senator JACKSON. Now you are working on a nonnuclear warhead for that which was the old Sprint system. Your tests so far have indicated, at least you can extrapolate from it, that there is a possibility of that approach working and it has the added advantage that the commander could fire without Presidential authority because it would involve a nonnuclear system.

General TATE. That is true. Today in our exoatmospheric overlay system we feel the technology is on hand for a nonnuclear kill. We will demonstrate that in [deleted]. In the atmosphere you have a much more difficult problem. First you have the atmosphere itself which in high speed flight becomes ionized. It gives you a problem in radiating through that, including fuse function and guidance.

Also you are down in fireball country where you have the multiple fireballs, the blast zone as well as the other nuclear effects. It makes it an extremely hostile environment. Achieving the very small miss distances that are required is simple in outer space. We believe we should be able to achieve miss distances of about [deleted] in outer space. Down in the atmosphere it is much more difficult to do that. We are going to have to have different kinds of warheads.

[Deleted.]

Senator JACKSON. Thank you, Mr. Chairman.

Senator WARNER. We will now proceed with our next witness.

STATEMENT OF DR. GEORGE MILLBURN, ACTING DEPUTY UNDER SECRETARY OF DEFENSE, RESEARCH AND ADVANCED TECHNOLOGY

Dr. MILLBURN. I want to discuss with you today the status of our space-based laser study. The next chart will show the main outline of the discussion today. I want to go through the background, the issues we have covered, the options we have considered for accelerating the program in response to Congress and then a short summary.

SPACE BASED LASERS—BACKGROUND

SASC requested report by 1 March.

"Analysis of technical, schedule and cost risks of accelerating."

"Detailed program plan for the earliest feasible on-orbit deployment."

USDRE formed committee:

Mission utility assessment panel.

Technology development panel.

Space integration and deployment panel.

As you know, we were requested in your report last year to report by the 1st of March assessing the technical schedule and cost risk associated with accelerating our space-based laser program and also in particular detailed program plans for the earliest feasible on-orbit deployment. Responsibility for this action was assigned to the Under Secretary of Defense for Research and Engineering. The Deputy Under Secretary for Research and Advanced Technology was named the chairman of a committee to prepare the report.

We formed three panels. The Mission Utility Assessment Panel was chaired by Mr. Lynn from the Office of the Deputy Under Secretary for Strategic and Space Systems. The Technology Development Panel was chaired by Dr. Sepucha from DARPA, and the Space Integration and Deployment Panel was chaired by General Ward from the Air Force Systems Command. In these panels we had participation throughout the Department of Defense and from the supporting contractors, so we had participation throughout the whole community. At the present time we have a draft report which will be reviewed by the Defense Science Board and the formal report will be submitted about the middle of May together with recommendations based on that review.

SPACE BASED LASERS—ISSUES

- (1) Does a SBL have potential utility as a weapon system?
- (2) What is the time scale for development and deployment of a SBL weapon?
- (3) At the present level of effort, when will the technology be sufficiently developed to allow a confident decision on a SBL weapon?
- (4) What is earliest time for availability of a SBL weapon system that would have more than minimum capability?
- (5) What is the optimum time (with respect to cost) for development and deployment of a SBL weapon system?
- (6) What should be the relationship of a SBL on-orbit demonstration to an operational SBL weapon?
- (7) What are the risks in developing and deploying a SBL weapon system?
- (8) What is relation of a SBL weapon to U.S. treaties and policies?

The next chart lists the eight issues that the committee discussed in some detail. I just want to take a few minutes to run through them.

The first issue, there is general agreement that space-based lasers

can be used for antisatellite, antiaircraft and eventually ballistic missile defense. Right now perhaps the most interesting application that we have considered is global antiaircraft use of space-based lasers, primarily because there is no other way we could see to do that mission on a global scale in a very short time period.

In all these cases there is less agreement about the utility of using space-based lasers versus more conventional means of doing the same missions. With particular emphasis on the ballistic missile defense we do believe that the space-based laser technology can evolve into a defensive system but the time schedule is approximately [deleted]. That estimate can be off by a large factor. If we look back [deleted] years ago, we didn't have lasers. We just barely had transistors. So, the development of technology over [deleted] years is so rapid I would not be prepared to [deleted] say that we would do anything similar to what we are discussing in our deliberations today. [Deleted.]

Cost estimates for ballistic missile systems are so uncertain that we did not believe they were of any great use.

The second issue: The nearest term space-based laser weapon system would be capable of performing limited antisatellite missions but would have limited capability against aircraft and almost no capability against ballistic missile attack. This development takes approximately [deleted] and operational deployment an additional [deleted].

A more interesting system would have global antiaircraft mission capability and would also have antisatellite capability and some capability against unhardened ballistic missiles either ICBM or submarine launched ballistic missiles. The earliest such system could be available is [deleted] but a more conservative development program which would reduce the risk in technology, cost and schedule would delay the IOC by about [deleted]. As I will point out later, even in this system we must have besides the laser device itself, a new surveillance system, new space launch system and a new command and control system.

The third issue: Our current program within the Defense Advanced Research Project Agency is only technology, and is not aimed at a weapons development program. That program will have its technology demonstration completed about 1987 and at that point in time we will then be able to reach a decision to go into the next phase of development. The next phase of development will take about 12 more years.

The next issue: The earliest time we could have a space-based laser weapon system available. As I said we need not only the laser systems but we need a new surveillance system, a new launch system and a new command and control system. Times for that would be approximately [deleted] and the cost for that over the next [deleted] would be somewhere between [deleted]. That cost is uncertain. It is little more than an educated guess at this point in time and the time schedule could easily be off by 4 to 8 years.

We then considered whether we could determine the optimum time for development of a space-based laser weapon system. We felt that we didn't have sufficient understanding of the technology to come up with a definitive schedule, but the best guess is that it would be somewhere between [deleted]. We also looked at the question of demonstrating as quickly as possible the potential utility of space-based

lasers by marrying the various other components with the laser device itself and putting it into orbit and performing some useful experiments. The problem that we have is that the cost would be between \$2 to \$4 billion, depending on how much supporting technology we would elect to develop along with it. There is a great deal of support for the position that for an investment of that magnitude, that we would have to have some residual utility. We would not wish to spend that much money on a satellite, put it into space, do an experiment and have no further use for that particular satellite.

Again we would have to consider the problems of surveillance, command and control and in this case we would probably have to start considering the survivability question.

The risks involved in developing and employing space-based lasers fall into four areas. The technical risk: We have an immature technology here. We have programs developing technology in supporting areas such as surveillance. Again we have no programs to actually produce these systems. In the systems area, we have limited studies to date on how we would do the engineering involved in putting all these components together. That probably is one of the major technical stumbling blocks.

Another risk is operational; how would we operate such a weapon system. We have had no experience in operating such a system. It is a global system. In many cases the command and control would have to be autonomous. We would have to delegate the decisionmaking to the weapon system itself and we have had no experience in that type of operational system. Of course there are national policy statements which would have to be considered. There are no considerations of policy which prevent us from doing the research and development. If we were to deploy it strictly for antisatellite use there would be nothing in any of our policies or treaties to prevent our doing that unless we actually used it to attack a satellite. There are restrictions in our treaties on ABM and it might be difficult to persuade an adversary that what we are putting up was limited to an antisatellite capability and did not have some type of ABM capability.

SPACE-BASED LASERS—MAJOR UNCERTAINTIES

Survivability;
Lethality/countermeasures;
Technology advancement;
Surveillance;
Launch capability;
Command and control.

The next chart lists the major uncertainties. Clearly deploying a weapon system of this nature would have great impact or potentially great impact on the strategic balance. It is something that an adversary would take great steps to counteract. We want to be certain that once we had developed a system and deployed it, that it actually would survive an attack by a determined enemy. Similarly the lethality of the system, current estimates of how much laser energy it takes to kill, for example, the ICBM booster, are [deleted]. If an enemy saw us developing this capability, he could take steps [deleted]. We see it potentially over the time period to develop an effective ABM system, he could [deleted]. Speculation as to what might be possible beyond that is just speculation.

Again how fast can we advance the technology of lasers? There are certain questions in developing the laser devices themselves that we have to answer. It is not certain whether or not we will be successful in the approaches we currently have underway. I have already mentioned in addition to the laser weapon we need a new surveillance capability in the global anti-aircraft mission which we discussed. We are developing the technology for doing both space-based infrared surveillance and space-based radar surveillance. It is likely that for the anti-aircraft application we would prefer to do the space-based surveillance using radar, but that technology is again just in the development phases and it is not mature enough for us to estimate what it would take to bring it into operational use.

The laser systems that we looked at weigh [deleted] with sufficient fuel to perform the missions that we have considered. That exceeds the launch capability of the Space Shuttle. It would be possible at least in the smaller systems to break the laser weapon into perhaps two or three components, launch them separately and assemble them in space. If you get to the more capable weapon system, systems that are capable of doing either global anti-aircraft or perhaps ballistic missile defense, it would probably be impractical to try to break the lasers into small enough components to do a multiple launch and assembly in space, particularly if we tried to do some of the more demanding adjustments for the precise pointing and tracking and precise integration of the laser and the optics employed in the system itself.

Again we have to develop new command and control technology, new command and control techniques for doing it.

SPACE-BASED LASERS—PROGRAM OPTIONS

- Option 1: Continue with current level of effort of technology development:
Conservative approach;
Not structured to support weapon development;
Approximately \$100 million per year.
- Option 2: Accelerate current technology program to resolve key technical uncertainties at an early date:
Resolves technical uncertainties more rapidly than option 1;
Could require \$200 million to \$300 million per year for 4 or 5 years.
- Option 3: Perform an on-orbit demonstration of a space laser integrated with its optics and pointing system in addition to an accelerated technology program:
Demonstration could occur in [deleted] cost \$2 billion;
Requires \$400 million to \$700 million per year.
- Option 4: Develop the earliest feasible space-based laser weapon system:
Very high risk;
Prototype flight could occur in 1990;
No growth potential.

Our next chart shows the four options that we developed. As is usually the case, option No. 1 is to continue doing what we are doing at the present time. As I have pointed out this is not an approach which is structured to support a weapon development program but it will demonstrate by [deleted] the existence of technology to support such applications. Our current program is about \$100 million a year and it is being managed and funded through DARPA.

As an illustration of the possibility of accelerating the technology development itself, we constructed a program which will resolve the technical uncertainties we identified more rapidly than option 1 and

essentially as rapidly as we could do it in an orderly way. This program would require expenditures of about \$1.3 billion over a period of approximately 4 or 5 years or about \$200 to \$300 million a year. Obviously there are other options in accelerating the technology that could be recommended or could be adopted. We could reduce the level of effort and accept a greater risk on a given time schedule of having the technology ready to support any decision we might make, or stretch out the time to resolve the technical questions.

Of course, as usually is the case, we could define a much more ambitious technology program that would involve parallel attacks on the technical uncertainties. Option 2 is an example of an approach which would resolve the technical uncertainties in the shortest time schedule that seemed to be sensible to us.

Option 3 then considered the next step in demonstrating this technology which is actually to marry the components together in a space platform and demonstrate from space the operation of a space-based laser prototype system. This demonstration itself which we could do toward the end of this decade if we were to decide today to start it, would cost [deleted]. We would not at this point in time find it sensible to do that program unless we also increased the supporting technology acceleration which would add another [deleted] to the total cost. The total cost of an experimental launch would be something between [deleted]. There is a significant risk in performing that program. It is not clear that we could meet the schedule.

Finally we looked at option 4 which funds the earliest feasible space-based laser weapon system prototype. We regard this as a very high risk program. The prototype we could put into space [deleted]. It would have the ability to perform an antisatellite mission. It would have almost no capability against aircraft and essentially no capability against ICBM attack. We considered this option to have no growth potential and it is not an option which we would recommend that the country pursue.

SPACE-BASED LASERS—SUMMARY OF OPTION COSTS

(Dollar amounts in millions)

Option:	Feasibility demonstration flight	Fiscal year—					Cumulative, fiscal years 1982-86
		1982	1983	1984	1985	1986	
1.	[Deleted]	\$89	\$100	\$132	\$101	\$83	\$505
2.		220	325	360	230	105	1,240
3.		370	605	710	675	560	2,920
4.		370	595	760	720	605	¹ (5,000)
							3,050
							¹ (4,025)

¹ Cost to complete.

The next chart will summarize the options in terms of the cost. The current program which could result in a demonstration flight in [deleted] is funded at about [deleted]. Total funding over the next 5 years is about [deleted].

Option 2 would reduce the time to perform a technology demonstration by about [deleted] and would add about [deleted] or cost over the next 5 years.

Option 3 would permit the demonstration to take place in [deleted] and would add over the next 5 years about [deleted]. The total cost to complete that program would be on the order of [deleted] depending again on how much supporting technology was and actually funded.

Finally, the prototype of an early weapon system would cost again about [deleted] to complete.

SPACE-BASED LASERS—SUMMARY OF MISSIONS

Mission	Brightness W/SR	Schedule on-orbit/10C	Weapon system cost (billions)
ASAT/DSAT			\$50
Antiaircraft			50
Ballistic missile defense:	[Deleted]	[Deleted]	
Damage "denial"			500
Limited			100

Summarizing, the next chart will show that there is about 1 year's difference in the schedule for doing both the on-orbit demonstration and developing the prototype of the antisatellite weapon system. This has a brightness [deleted] typical of what we think we can achieve with a [deleted]. If we added 1 more year on that schedule we could probably develop a technology to support a laser weapon which would have [deleted] an order of magnitude greater. This is typified by a laser [deleted]. It would be the same cost as doing the first system and would take approximately [deleted].

I have to caution those costs are highly uncertain. They are little more than educated guesses and the schedule could be off by several years depending on problems that we might encounter. Ballistic missile defense we felt would require approximately [deleted]. This would be typical of a laser of about [deleted]. We did not believe we could do this before the year [deleted] and probably, as I said, it would take about [deleted]. It might be [deleted] before we would have such capability. The cost estimate is [deleted] billion depending on whether the mission is a damage-limiting one or just, for example, one of defending the ICBM force.

The layered defensive system that Dr. Zeiberg and General Tate addressed would be an earlier type and could be part of a three-layered system that space-based laser would attack during the launch phase and infrared system attack after the RV's were deployed and of course the terminal system itself.

That briefly summarizes the status of our study and we do have a summary report which we hope to transmit to the Congress shortly and we will have a final report ready about the middle of May and we will be able to make oral reports in the interim to the committee and its staff if you so desire.

SOVIET PROGRESS

Senator WARNER. What is your assessment of the progress being made by the Soviets?

Dr. MILLBURN. The Soviets have a program which, if we tried to judge it on the basis of what it would cost us to produce it is three to

four times larger than ours. [Deleted.] We have some indications they may be doing that but it is not very hard and fast information.

Senator WARNER. Senator Jackson?

Senator JACKSON. In addition to lasers they have been pursuing a rather active research program on ABM and that has never stopped, has it? In terms of what we are doing, maybe the General or Dr. Zeiberg could respond on this one and then on the laser.

Dr. ZEIBERG. They are spending close to [deleted] a year. They are maintaining an operational site at Moscow. They are in the process of upgrading that site.

Senator JACKSON. What is your evaluation of that site?

Dr. ZEIBERG. That site, by itself, has no operational significance. It has a small number of interceptors and it can readily be saturated. So, it does not bother us operationally. It provides, however, the base to the Soviet Union for expansion. It trains troops and it develops doctrine and so forth. Their R. & D. activity is very vigorous. We have seen them, since the early 70's, develop what you could call the Rapidly Deployable System. We call it the ABM-X3.

Senator JACKSON. Is that at [deleted]?

Dr. ZEIBERG. [Deleted.]

Senator JACKSON. Thank you.

Senator WARNER. Senator Wallop?

Senator WALLOP. Thank you, Mr. Chairman.

As you can imagine, there are a number of questions that I will submit for the record.

SOVIET SURVEILLANCE CAPABILITY

Doctor, you said there is no evidence of Soviet surveillance capability. What about the missile pointing and tracking experiments they get from Salud?

Dr. MILLBURN. [Deleted.]

Senator WALLOP. That is the point, isn't it? That is, what a laser system would want to detect is pointing and tracking capability in the launch phase, so they are demonstrating an interest in surveillance, are they not?

Dr. MILLBURN. [Deleted.]

Senator WALLOP. I don't think you do know that, do you? We don't have the results of their experimentation, only that they did it.

Dr. MILLBURN. [Deleted.]

Senator WALLOP. [Deleted.]

Dr. MILLBURN. [Deleted.]

Senator WALLOP. AI-1138 does not give you an indication that there is perhaps a harder statement that what you are offering the committee?

Dr. MILLBURN. I would have to go back and review that document. I am certain I have seen that one. I have been updated by both the Defense Intelligence Agency and the Central Intelligence Agency in the last month and the assessment that they gave me indicates that [deleted].

Senator WALLOP. That is the point. [Deleted] we can't be so certain that we are as comfortable as your statement would make out. Also, as

Dr. Zeiberg said talking about sites, isn't it true that site does not have much meaning any longer with the new radar capability that is at Moscow and the mobility of which you spoke? It is not as though we were talking about sites where everything was fixed and we had a limited vision with its radar or limited ability to move from there?

Dr. ZEIBERG. The local sites could be movable on a time scale [deleted].

Senator WALLOP. It is also the range of the tracking?

Dr. ZEIBERG. Right. They need to be supported by long-range radar. Their constraints are to be movable only within the footprint of the radar that supports them. That gives them wide latitude.

Senator WALLOP. They have substantially increased range, have they not?

Dr. ZEIBERG. Yes; one supports the other. It is a queuing process. A long-range radar tells the local radar to get ready, that something is coming.

Senator WALLOP. When you stated your opinion in the remark you just made, is that unanimously held or does DARPA have different ideas?

Dr. MILLBURN. I would say there is a wide range of opinion within the Department of Defense as to who to interpret what data we do have.

Senator WALLOP. Some of which is substantially more optimistic than what you presented?

Dr. MILLBURN. Either optimistic or pessimistic.

Senator WALLOP. I doubt there is a very much more pessimistic view. This is the most pessimistic presentation I have heard on all of this either by industry or people directly involved in it. There may be reason for caution in there.

Dr. WADE. We have a DARPA representative.

Senator WARNER. Would you care to give your own view?

STATEMENT OF DR. DOUGLAS TANIMOTO, DIRECTOR, DIRECTED ENERGY OFFICE, DARPA

Dr. TANIMOTO. The question having to do with intelligence estimates and projections, I would like to defer to an intelligence briefing.

Senator WALLOP. We are talking about whether the view that was expressed by Dr. Millburn is unanimous or whether there are more optimistic views as to time frames, cost, and potential.

Dr. TANIMOTO. I would like to address that question by first saying there is a lot of controversy even among the experts on [deleted].

The present program at DARPA really addresses the demonstration of the key elements of a [deleted].

In the present effort, I don't see that we would have the total systems [deleted].

Senator WALLOP. Under the present program that we are proceeding on now, but if we were to make a more concerted effort?

Dr. TANIMOTO. Even that discussion is quite controversial and I think a lot of that has to do with the uncertainty with respect to the projected [deleted] of your systems that you must have developed and deployed.

Senator WALLOP. Let me ask you this, or Dr. Millburn—either one. In your concern about [deleted] and [deleted] to [deleted] reverse that question for me. What would we do to the [deleted], even a rudimentary system, which might have a missile defense capability by the middle of this decade as was recently publicly speculated? Could we [deleted].

Dr. TANIMOTO. I think if one were to work toward [deleted]. I think we are talking about a [deleted]. Again that is a controversial subject. I feel that the present program [deleted].

[Deleted.] I think it is the unanimous position within the community that that is an important logical step necessary to go to a weapon system. [Deleted].

Senator WALLOP. Is it also fair to say that there is a great deal more optimism among contractors than has been expressed here?

Dr. TANIMOTO. I would say that that is correct. Let me make a personal comment in that regard. I feel that one has a difficult time projecting the cost and schedules when one looks out 10 or 20 years. I think we always tend to underestimate the cost and schedules in the near term but we tend to overestimate because of the conservatism built into the uncertainties and fudge factors that one throws in when one is embarked on a program that is quite different from anything we have done in the past.

Senator WALLOP. Would you agree with Dr. Millburn's statement that there appears to be [deleted].

Dr. TANIMOTO. I think rather significant accomplishments have been achieved in the last 2 years [deleted] of present technology. I believe the technology that is being addressed today can [deleted] and that may be a personal opinion. I think there are a lot of community industrial folks who will support that. I feel again there is a broad spectral range of positions in this regard because of the question of utility when one looks in the context of lethality against various types of threats, hardness that one can provide in new materials as well as the survivability of a very expensive asset in space.

Senator WALLOP. Obviously those are questions that have to be dealt with. While we are assessing that risk presumably we have to assess the other risk of what happens if they get there first?

Dr. MILLBURN. For one thing the [deleted].

Senator WALLOP. [Deleted.]

Dr. MILLBURN. The scenario we have considered specified a [deleted]. They are more or less comparable in numbers. The problem that we face is that our payload is smaller, so that the countermeasures we might take would be, from one point of view, less attractive to us. They represent diverting payload that certainly we would not wish to divert from its primary mission. I think that is a significant difference.

We must increase the amount of effort that we devote to [deleted] and that is something we will be doing in the next few years.

Senator WALLOP. One of the things that troubles me about the assumptions that I hear coming out of you is that in the risk area you assume on the capabilities of a laser system for BMD a capability which is probably beyond that of the Soviet Union and a desire

on our part for a [deleted] of virtually everything. Yet when it comes to getting assumptions back as to what we can do, you are unrealistically timid. So you apply them giant-killing capability at one time, straight across, of [deleted].

On the other side you attribute to them not the capability of deploying a weapon that could do anything to seriously harm us.

Dr. MILLBURN. I think that if they could deploy a weapon system, there are differences in our systems and their systems. Some are in our favor and some work against us. The short burn time of a solid propellant booster works in our favor vis-a-vis a liquid propellant booster. The smaller payload we have works against us in terms of attractiveness of trying to take countermeasures such as [deleted]. We could [deleted] and take a reduction in the payload. It might mean instead of three RV's on Minuteman we would have to go down to two. The Soviet Union instead of having 10 RV's on the SS-18 might go down to 8. That is quite a different outlook on what it would cost us. Furthermore they do have ABM systems in being which we do not have.

They have a civil defense system which from all reports is much more effective than anything we have. If we wanted to look at the capability of using this system to defend the United States and use a space-based laser system as our only ABM system, it is very unlikely we could get the leakage rate down below something on the order of [deleted].

Even that would be less leakage than any ABM system we have considered to date. At that rate if we considered the Soviet numbers of reentry vehicles they could fire at us, the numbers that could penetrate through that defense could cause significant damage to the United States. It is unlikely we would consider doing a space based laser ABM system without having an overlay system and most particularly, from my personal viewpoint, without an adequate civil defense capability to back it up.

Senator WALLOP. Again you attribute to them a capability on the one side and lack of capability on the other, which is bizarre to me. I want to know, Dr. Zeiberg, why did you cancel the tests [deleted].

Dr. ZEIBERG. Because I thought they were pointless as they were constructed. Let me point out that I did initiate tests [deleted].

Senator WARNER. I am going to identify for purposes of the record that we have here today General Ward, Mr. Lynn, Dr. Sepucha, and Dr. Richard Airey. Each of you gentlemen stand for a moment and identify your areas of responsibility.

Dr. AIREY. My name is Richard Airey, Director of Directed Energy Programs in the office of the Under Secretary of Defense for Research and Engineering.

General WARD. I have all the technology programs which include lasers.

Mr. LYNN. I am Larry Lynn, Director of Defensive Systems in O.U.S.D.R. & E.

Senator WARNER. We have one remaining, Doctor?

Dr. SEPUCHA. I am Dr. Sepucha. Assistant Director for Space Defense Technology, in the Directed Energy Office of DARPA.

Senator WARNER. Thank you for attending this morning. We may ask questions of you.

Senator WALLOP. I will ask the most obvious question: Is there unanimity of opinion, or is this a committee report?

Senator WARNER. Will you gentlemen take seats here?

Dr. MILLBURN. I have read each and every word of that report with some care. My final question of each of the members was not were they happy with it but were the words in the report acceptable. The words were acceptable, though in many cases they would have individually phrased them differently. In every case, the words in that report were reviewed by the gentlemen sitting here, or their representatives, and were found to be acceptable to them.

Senator WALLOP. One of the problems you get when you ask for a report is that with words that have been wrestled over and generally agreed upon you lose the thrust and direction of the intellect of any of the individuals involved.

One of the reasons why I found this an unrealistic assumption is in your power requirements for an [deleted] you are talking about [deleted].

I will ask Dr. Tanimoto if there is not some feeling within the industry at least that [deleted] would have significant [deleted].

Dr. TANIMOTO. Senator Wallop, I am not sure I got the gist of the first part of your question.

Senator WALLOP. There is an assumption in the charts that Dr. Millburn put up that before you had any kind of [deleted] capability you would have to go to [deleted] before you would have power enough to have such a capability.

Dr. MILLBURN. I think what I said is that the [deleted] system, the [deleted] would have some capability against [deleted] but might not have general capability against what we might project the Soviets will do in the future.

Dr. TANIMOTO. Most of the analyses for ballistic missile defense-type scenarios really looked at [deleted]. That is a controversial subject. There are ranges [deleted].

Senator WALLOP. Isn't there an interesting thing that is perhaps not mentioned here, that if you are looking at [deleted] that might be developed in the [deleted] you are making an assumption that [deleted] now are unsatisfactory and that the deployment of a system that has even modest capability would require the redesign of a [deleted] system? Would that not be of some benefit to the country?

Dr. TANIMOTO. Definitely.

Dr. ZEIBERG. May I interject a point on that?

The question is, how fast [deleted] versus how fast could you deploy the space-based laser system? That is the center of the issue. The numbers that were used in the studies were based on [deleted]. The question of whether you could [deleted] the missile in the silo or the local maintenance depot, or whether it takes many years, was addressed.

It was the general opinion that [deleted]. It was a relatively straightforward retrofit. That is probably a reason why the quickest attempt we could make to deploy a space-based laser ABM could be beaten by [deleted].

[Deleted.]

Senator WALLOP. [Deleted.]

Dr. ZEIBERG. No. There were some numbers that gave us some indication that [deleted] on Minuteman probably protects up to [deleted]. [Deleted].

Senator WALLOP. You are not contemplating toying with RV's with this item? You are basically not contemplating any defense against RV's with the space-based laser system; it is a missile defense system?

Dr. ZEIBERG. I raised it because [deleted].

Senator WALLOP. They are extraordinarily heavy?

Dr. ZEIBERG. They are heavy only as a function of the amount you put on.

Senator WALLOP. Yes, the function of the amount you put on is the function of the effectiveness against a laser; is it not?

Dr. ZEIBERG. Let me point out the dimensions. Our highest performance reentry vehicles have [deleted] material on them that protects them in terms of total energy absorption many, many times what space-based lasers could put on them. [Deleted.]

Senator WALLOP. Why don't we try it?

Dr. ZEIBERG. [Deleted.]

Senator WALLOP. Dr. Millburn, part of your statement really troubles me; that is, when you were talking about the possible reactions of an adversary. It seems to me that that is the sort of typical attitude that ends up with the United States not doing anything, and then inactive and accelerated experimentation with the very kind of systems we are talking about slowing down or being cautious about. In other words, what would be the attitude of a potential adversary if we were to deploy one of these? What in the ABM treaties would prohibit the United States from going ahead with this system if we achieved the capability of deploying it?

Dr. WADE. The specific herefrom the ABM Treaty is that there are no basic restraints in doing this type of research. If you reach a position to deploy, then the treaty, in effect, prohibits deployment of a space based ABM system of any sort, without first through consultation reaching new understandings.

Senator WALLOP. If they had that capability, they would engage in consultation, but do you suppose they would hesitate to deploy?

Dr. WADE. If it were to their advantage to deploy, they would most likely go ahead and deploy.

Senator WALLOP. There is nothing to inhibit us if we achieve the capability?

Dr. WADE. If the technology offers us the type of potential that people talk about here, I think we would go ahead and deploy a system as fast as we could, perhaps notifying the Soviets at the same time.

Senator WALLOP. Why is it not in the interest of the United States to accelerate this? In all of the weapon programs I have been familiar with, and that is not that many, every time we have taken the cautious, long-range approach, we have not improved our capabilities and have increased our costs rather enormously. What is the risk here in accelerating this program and trying to get a capability which we know by Dr. Millburn's own testimony that they are actively engaged in testing and are outspending us substantially on?

Dr. WADE. Your point about being slow is a correct observation. I think we have been through a period of learning from such mistakes,

time and time again, over the past 10 years. The question you are really addressing is that there has been a reluctance over the past 5 to 8 years, for a variety of reasons, to be serious about defense measures associated with active defense.

Senator WALLOP. I am happy to hear you say that.

Dr. WADE. My observation is that with a new team coming aboard, you will see an increased interest and emphasis on measures associated with active defense. The question here is simply is there a place for a high energy laser system and particularly for a space-based weapon system? What we need to ask ourselves is to place the subjects in a broader context; for example, as to ABM systems, their conventional and their nuclear role both in the near, mid, and the long term vis-a-vis the possibility of trying to add this space laser technology you are talking about.

I believe personally the program has been underfunded over the past several years, in the sense of pushing technology and trying to understand what is the maximum potential in terms of where it could be applied and how and soon could it be applied to military problems.

I believe to make that fast step, and jump in toward driving a space demonstration or a deployment before we have an understanding of what the potential of the technology is would be a mistake, because we do have overall an affordability problem. One could judge that over the near term the payoff could well be in conventional ABM systems, which you know as well as I that the technology R. & D. has been massively underfunded over the last 8 years.

The more important point here is for a need to reassess the totality of our defensive technology. Certainly, you will see by the Reagan budget that there will be money added to the program. These funds address primarily increasing our understanding of the technology issues, and thereafter we will see where we ought to go, as far as deployments are concerned. Right now, to say we are in a position, in a technical sense, to really go all out, that question cannot technically be justified.

Senator WALLOP. Let me suggest what I have heard from the industry and allow you to comment.

Technically, we are really not talking about any major breakthrough necessary to get ourselves a fully functional, capable space-based laser, that there are engineering problems, but there are no frontiers there to be breached, and that the biggest inhibition to forging ahead with a system is our capability in this country to do something which we know how to do but don't have the ability, and that is the construction of the MIRV.

Dr. WADE. I am not sure of that. For example, the question of how you handle a nuclear weapon employed in space against a laser battle station is a serious and yet unanswered question.

Senator WALLOP. How about the same way you would handle anything else coming at you, which is what it is for?

Dr. WADE. A nuclear weapon has the most efficient energy density of any weapon you can employ in space right now. I am not saying we can't defend against a nuclear weapon in space somewhere downstream, but we cannot do it now. We should be doing more research here.

Let me go back to the point you made earlier. I believe if the Soviets would deploy a space-based system in 1985 and 1986, it most likely would be ineffective, as far as ballistic RV's go.

Senator WALLOP. I'll bet you it would have one effect.

Dr. WADE. Yes, if they could light up the top of the atmosphere, it would indeed have a dramatic effect.

Senator WALLOP. I'll bet our program the day after that would look very much like the day after sputnik. If that is the case, we ought to be making slightly less cautious judgment now.

Dr. WADE. Yes, we have turned our program around, and are putting additional money in it.

Senator WARNER. Senator Wallop, I think it would be helpful if we offered an opportunity to each of the other witnesses to give an expression of their respective departments and agencies and any personal views they might have.

Senator WALLOP. Could we ask Dr. Pike in the back of the room.

May I say that my general questions are over and there will be some technical questions I would like to submit for the record for response?

Senator WARNER. I think the other witnesses you identified work for DARPA; is that correct?

General TATE. Yes, sir.

Senator WARNER. Why don't we start over with Dr. Sepucha.

**STATEMENT OF DR. ROBERT SEPUCHA, ASSISTANT DIRECTOR
FOR SPACE DEFENSE TECHNOLOGY, DIRECTED ENERGY OF-
FICE, DARPA**

Dr. SEPUCHA. In terms of the findings of the Technology Development Panel which I chaired as part of the space laser study, I would like to make the following comments. One of the findings of the panel was that, in its judgment [deleted] and beyond. That is not to say there are not serious technical issues to be resolved. There certainly are; however, we see multiple potential solutions for those issues and we have confidence that we can resolve them.

The panel also concluded unanimously that in terms of developing technology and in terms of establishing technical feasibility of these kind of laser systems, what is essential [deleted] to verify that this kind of technology performs to our expectations [deleted]. Only at that point can we say with confidence that the technology base is fully developed.

Senator WALLOP. I agree with you and obviously you know more about it than I, but one of the problems with the path that we took last year is that it does not lead to [deleted] but a separate blockhouse, earthbound environment test which [deleted] tested in laboratory situations.

Dr. SEPUCHA. The current funding limited program, as you well know, is centered on three major technology thrusts, and three independent demonstrations. These demonstrations do not address any kind of [deleted]. They simply do not include that [deleted]. Only some of the uncertainties mentioned by Dr. Millburn are being addressed in the current program. Some are not being addressed to sufficient depth, such as [deleted]. The current demonstrations, are addressing some of the key technology issues associated with the laser device, pointing and tracking and large optics. These are very important steps, but I personally think [deleted].

STATEMENT OF GENERAL WARD, DIRECTOR, TECHNOLOGY PROGRAMS, INCLUDING LASERS

General WARD. From the work done so far in this area, I think Dr. Millburn's statements and comments reflect properly what the Air Force sees as the significant potential for global operational concepts of space based lasers. His comment concerning the risk of technology I certainly agree with. We are trying to extrapolate from very little data and don't even have experimental equipment yet.

Senator WALLOP. The risk department?

General WARD. The risk of being able to build these devices at power levels we are talking about, in the timeframe we are talking about, and at the weight we will have to have them.

Senator WALLOP. What is the penalty for failure to risk?

SPACE-BASED LASER RISK

General WARD. The penalty for failure would be improper use of resources. We have a large program at the present time. There were a number of issues that Dr. Millburn raised concerning the development of space-based lasers.

Senator WALLOP. Would you address as well the risk of failing to proceed?

General WARD. I think we are proceeding on a fairly ambitious program now. It is over \$100 million a year.

Senator WALLOP. I am asking really what is the risk of our being second in the starting gate with regard to our own ICBM capability, our own capability if we have—and as you have, I think, correctly identified, one of the great potentials of this, our antiaircraft capability and much of our deterrence is dependent upon aircraft. What is the risk there of allowing them first in the gate? Is it higher than the risk of misuse of resources, do you think?

General WARD. [Deleted.]

Senator WALLOP. You would have to make some rare assumptions, would you not? You could not assume that it was only prototypical and not with some capability?

General WARD. [Deleted.]

SPACE-BASED LASER'S IMPACT ON STRATEGIC BALANCE

Senator WALLOP. It might also have significant effect on world opinion, would it not?

General WARD. That is true. [Deleted.] It would be of more political significance than military.

TECHNOLOGY OPTIONS

Senator WALLOP. You begin to combine those things and it gets to be an uncomfortable situation, and certainly uncomfortable in negotiating.

General WARD. I come back to the point that I think we are developing the technology options that are needed. [Deleted.]

In addition to that, we have that size program in the nonspace area, plus a large number of projects we have in the earlier stages

of technology development creating new options, and some of these new options may be the ones that will pay off in a future system [deleted] downstream.

Senator WALLOP. Let me interject something which has happened to this country. We have become so fascinated with our technical capability that we are always waiting 1 more year for one more capability. We don't seem to be getting onstream. Look how long it has taken to get the MX, how long it has taken to get the tank.

You say, "Gee, there is a new steering mechanism that will give us increased capability. What we have now is for comfort."

SPACE-BASED LASER INVESTMENT

General WARD. We have been in the laser business for over 12 years. We have invested over \$1.4 billion. We have made a lot of progress [deleted].

The space environment is a tough environment, too.

Senator WARNER. Let me just finish with the panel.

STATEMENT OF VERNE L. LYNN, DIRECTOR OF DEFENSIVE SYSTEMS, O.U.S.D.R. & E.

Mr. LYNN. First, I would like to give you some of my thoughts on the utility as the chairman of the Utility Assessments Panel and then try to deal with the question of what if the Soviets proceed. I think there is no question but what there is a great deal of potential from space-based lasers. They have the capability of affecting the strategic balance, as has been said many times.

The question is, really, what does it take to do that, when can we do it, and questions of that sort. As a first order we looked at the kind of systems that it would take to accomplish various missions. We tried to look at the question of countermeasures, not the countermeasures we can produce today but, rather, what might be there in the 20-years-from-now time frame that the lasers have to exist in.

As in all other aspects, there are spectra of opinions and we centered on something like a median value and tried to use that. If you take a first order cut at that, it says you can build a [deleted] antisatellite system for a [deleted] dollars or you can look at an anti-aircraft system for on the order of [deleted] specifically, or you can look at the damage limiting BMD, the full BMD, that defends the country, with potentially a [deleted] for on the order of [deleted].

Those are ball park numbers.

ANTIAIRCRAFT MISSION

The most attractive in the near term to the group that looked at this was the anti-aircraft mission; it is a mission which can't be done today by any other means aside from bringing in a lot of airplanes. It is an attractive mission. It has some major uncertainties associated with it. That is probably the area in which we understand the countermeasures best in terms of the hardening of the aircraft.

The surveillance in this case is very important. It probably requires a space-based radar system for the acquisition.

Those are issues which are being looked at. I don't think the answers are in yet as to what it would take, or do we have any high confidence in the numbers I am reporting.

Likewise with the cost. There is no question but what the compelling motivation would be to build a system that would get us out from under the nuclear "high noon" that we have now. I think all of us recognize that. That is why the damage-limiting BMD is attractive.

The thing that concerns me is that there are enormous uncertainties. The principal ones are with respect to its [deleted] which we talked about, and the survivability of the laser.

The laser in this case could threaten the strategic balance. It would be an extremely high-value target. Again, there are no returns in on that but it is easier to develop threats to the laser than it is to solve them.

I won't bore you with a reiteration of all those threats.

The thing that really concerns me is that the uncertainty is great enough that it is not clear that the DF/HF laser is the right way to go if you want to evolve to a damage-limiting BMD. There is no question you can do a lesser job. However, if we want, the full BMD, it is not clear to me that we don't have to have a shorter wavelength.

In terms of where we should go today, this is a personal opinion—my feeling is that we need to pursue the technology. I am not prepared to commit to a particular direction and I do believe that we should add emphasis in our work to at least two areas. One is in the development of the various other kinds of lasers—shortwave lengths and things that offer the promise of much higher brightness. Basically, the [deleted] is what I would call, given all the uncertainties, marginal for the BMD role.

I would like to see something on the order of a magnitude or two more of brightness to make an attractive system. I am more interested in the things that are even further along in technology. I think we ought to emphasize those because that is where a technological surprise from the Russians could really hurt us.

Second, we ought to look very seriously at the question of all the countermeasures, so that we understand the countermeasures' technology, not only the hardening but also the ability to attack a laser.

SOVIET THREAT

Let me, without going at great length, say a few words about the Soviet threat. I think, from everything I know of the intelligence, that it is very hard to say what might happen. It certainly is possible, in a few years, that the Soviets might put up a space-based laser. I don't think anybody could question that.

Those are things that are difficult to get a good understanding of. The question is, as you posed it, what does that mean to us? I think it is clear—and Dr. Millburn talked a little bit about the asymmetries of the situation—that this is an area that we have only begun to look at. But it is clear that there are two major factors in our favor. One of those is the longitudinal extent. The Soviet systems are spread out farther and cover the entire Russian countryside, whereas ours are quite concentrated.

There is another factor of about two in that our boosters burn for shorter times.

They are coalesced in a small area. It is roughly a factor of three. It is thus about a factor of six more difficult, all other things being equal, for the Russians. All other things aren't equal but it is very clear that is a tough proposition for them with the kind of technology that we are talking about, chemical laser technology. It is a tough proposition for them to do a damage-limiting BMD against our system even with their current hardness.

I don't want to suggest that all the returns are in. It is not clear that a few lasers would, in fact, change the balance.

I also agree with you, however, that if a couple of lasers go up, that we will certainly overreact to that. We will have to think they are 10 feet tall and the uncertainty of the brightness level they have achieved is certainly a reason for that approach.

In the kind of technology that we are talking about, I don't think that a few lasers would be a major threat; however, it might well cause us to panic because we would certainly have to worry about our airplanes, given the uncertainty of the brightness.

Senator WALLOP. Their worry with regard to Minuteman would be diminished by a counterforce preemptive strike. They would not have to look at so many targets?

Mr. LYNN. That is correct; we have looked at that. For the sake of analysis, if we allow 16 percent to survive that first strike, then we are back on an even footing. Even with just a residual force of relatively small numbers, it is not a trivial problem.

STATEMENT OF DR. RICHARD AIREY, DIRECTOR OF DIRECTED ENERGY PROGRAMS, O.U.S.D.R. & E.

Dr. AIREY. In the way of background, I have been involved in the laser program since its inception in 1965. I have devoted my career to this particular area.

I think the statement that our best assessment indicates the earliest time that space-based weapons could make a contribution to our defense posture is in the [deleted] is a correct statement, based on my assessment of the technology.

The real question then is whether the Department of Defense should fund this area to support the earliest attainment of that capability. I cannot say I am qualified to judge that question. It is a question of affordability, a question of risk, and really that is up to the Secretary of Defense to determine.

STATEMENT OF DR. H. ALAN PIKE, DEPUTY DIRECTOR, DIRECTED ENERGY OFFICE, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Dr. PIKE. It is clear from the discussion we have had that there is a wide variety of views. However, if you listen carefully to the things that have been said this morning, you will find we are all saying several things in common.

It is clear that we have all said that there are uncertainties resolved [deleted]. There is uncertainty in the potential countermeasures and

uncertainty in the measures that we would have to take to insure [deleted]. There are uncertainties in [deleted] we should use to achieve these capabilities and those, in turn, lead to uncertainty in cost and hence utility.

If we all agree those uncertainties exist, let us look at the potential. I think we have all said there is a great deal of utility if the uncertainties are favorably resolved. Some of the missions can be done no other way.

CHANGE IN STRATEGIC EQUATION

The potential here for major change in the strategic equation is very large. What is required is to resolve these uncertainties. If they are resolved favorably, then it is clearly an attractive approach for us. If they are resolved unfavorably, we will have to look elsewhere for an approach to these strategic capabilities.

We are all saying there is uncertainty, but there is also high potential utility.

I think the key issue we are addressing is the pace of the program that we should pursue to resolve those uncertainties. That is where we should focus our attention in discussion about what can be done, and within that context we should focus our attention on what should be done [deleted] rather than what this may lead to in [deleted].

If you look carefully at what Dr. Millburn and Dr. Wade described earlier, you will see that we can, in fact, offer options that give us high confidence, by means of demonstrations of our ability to achieve integrated systems that achieve impressive technical performance goals somewhere between [deleted].

I think we should focus on that interim capability. We have also discussed options where we would continue to resolve [deleted].

A fourth option we discussed was to [deleted] and I think among those previous options are various paths that one can use to enhance the growth potential. I am sure the growth potential does exist.

Those four options, I believe we all agree, are a sensible set that cover the waterfront. The decision as to whether one approaches this with [deleted]. I believe, is beyond the purview of those of us technologists who prepared the inputs for the report. It is really a decision in which, as Dr. Wade mentioned, you have to look at affordability.

As Senator Wallop mentioned, you also have to look at the affordability of the risk that [deleted].

Again, those technology elements [deleted]. We are talking about [deleted].

Senator WARNER. Dr. Zeiberg, you indicated you wished to comment?

DEFENDING AGAINST SOVIET SPACE-BASED SYSTEM

Dr. ZEIBERG. I want to offer the point that we have to carefully separate the significance of the U.S. space-based laser program for our military objectives from what might happen if the Soviets clearly demonstrate a system that we will react to in a conservative way.

If we worry about that eventuality, then we need to stress the countermeasure aspect, and demonstration of our laser will do absolutely nothing to mitigate problems that would develop if the Soviets demonstrated a space-based laser. Consequently, we have to separate those

issues carefully and we need to consider how to harden our missiles and, more importantly, learning how to shoot down any space-based system they might have.

Therefore, our antisatellite program has to be sufficiently vigorous and, as part of that, I would argue that one of the foremost principal objectives [deleted].

I am confident we can [deleted].

If we build [deleted].

[Deleted].

We could negate their system before they had a chance to use it. That is certainly far more important than a lot of the other things.

Senator WALLOP. If you listen to the testimony of Dr. Millburn and Dr. Wade, that is the most obvious and the first capability of a space-based laser satellite, ASAT capability, the dual advantage of having a more flexible program underway and the ability to—

Dr. ZEIBERG. [Deleted].

Senator WALLOP. That is a sustainable argument?

Dr. ZEIBERG. I would bet my right hand that I am right on that one.

Senator WARNER. We are running out of time. I suggest that those who have other observations kindly submit them for the record.

General Tate, you have been very patient. I know this is very much in your area.

Senator WALLOP. Mr. Chairman, I want to thank you very much.

Senator WARNER. I appreciate your coming forward this morning and participating in the hearing. I know of your extensive interest in this matter. We welcome your participation. I hope we can prepare a record with which we can create a lively debate.

General Tate, would you mind submitting your statement for the record?

General TATE. All right, sir.

Senator WARNER. Gentlemen, I thank you for your patience this morning. We will now conclude the hearing.

The record will remain open until 5 p.m. Since I have deferred to my colleagues, I will therefore put all of my questions in the record.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

SPACE LASER WEAPONS

Senator WARNER. High energy lasers are only some of the directed energy weapons being considered for the strategic mission. Charged and neutral particle beams, although less mature technologically, may offer even greater possibilities in the ballistic missile defense role. Also, the chemical lasers being studied by DARPA may ultimately prove less suitable for BMD missions than free electron lasers, X-ray lasers and other approaches being developed.

Dr. Zeiberg and Dr. Millburn, could you describe for this Subcommittee the different approaches to directed-energy weapons which might be applicable to strategic missions, either ground- or space-based? Evaluate the maturity of those technologies and give their advantages and disadvantages in military missions.

Dr. MILLBURN. The application for which the technology is most mature is the ground-based laser antisatellite weapon. [Deleted.]

The technology for space based laser systems using deuterium fluoride or hydrogen fluoride laser systems is next most mature. We are presently in the process (the DARPA Triad program) of developing components for such a system. The technology using other types of lasers is even less mature. The basic feasibility of building lasers of short wavelength scalable to the necessary power levels with adequate efficiency has not yet been demonstrated.

Particle beam technology is also very immature. The use of ground-based particle beam weapons for point defense against ballistic missile attack may be possible. We presently have an effort (White Horse) to demonstrate on the ground the basic feasibility of generating a particle beam with sufficient beam quality to be useful at long range for space-borne applications.

Dr. ZEIBERG. I agree. [Deleted.]

LASERS IN SPACE

Senator WARNER. In the last year much attention has been given to high energy lasers in space. In theory, lasers work well in space because there is no atmosphere to diffuse the beam. Nevertheless, there are many applications of high-energy lasers for weapons operating in the atmosphere which are nearer term and less demanding than the space mission.

For example, high-energy lasers have already shot down TOW guided missiles and would be extremely effective against groundbased tactical, optical systems infrared night vision devices.

I understand that Dr. Airey, a long-time leader in high-energy laser research, is present today. I would like to ask him a few questions:

Dr. AIREY, could you describe for the Subcommittee how high-energy lasers might be deployed as a weapon system within the atmosphere?

Dr. AIREY. There are many potential applications for the high energy laser within the atmosphere. [Deleted] lasers could be used on the forward Army battlefield [deleted]. Higher power lasers could be used for all aspects of air defense, shooting down missiles as well as aircraft. A particularly effective application might be the defense of high value assets such as radar sites [deleted].

Naval applications of the high energy laser could include shipboard defense against the anti-ship missile. Airborne applications could include the defense of aircraft against surface-to-air and air-to-air missiles. This might include defense of the manned penetrating bomber, the cruise missile carrier, and airborne warning and control aircraft. An airborne laser could also provide a longer range defense against anti-ship missiles than that which could be provided by shipboard laser systems.

[Deleted].

Senator WARNER. Dr. Airey, compared to the current state-of-the-art, how much progress has been made toward deploying various types of high-energy laser weapons systems within the atmosphere?

Dr. AIREY. The basic feasibility of the use of the high energy laser as a weapon within the atmosphere has been demonstrated in a number of experiments, and in particular in the shoot down of TOW missiles in the spring of 1978. We are presently pursuing a number of demonstrations to verify that high energy lasers can be sufficiently lethal to be competitive with other means of accomplishing a given mission. These demonstrations include the airborne laser laboratory (ALL), which we expect to conduct a shoot-down of an air-to-air missile in-flight in the near future, and the Navy's Sea Lite program, which is expected to demonstrate laser lethality in a generic air defense role including anti-ship missile defense in the [deleted]. The Army is pursuing two demonstrators, the Close Combat Laser Weapon (CCLAW) and the Forward Area Laser Weapon-Demonstrator (FALW-D). By the mid 1980's we should have the technology data base in hand to make a decision on whether to prototype weapon systems for several applications.

DEPLOYING GROUND-BASED LASER

Senator WARNER. Dr. Airey, compared to the deployment of a high-energy laser in space, how easy would it be for the United States to deploy a ground-based, high-energy laser weapon system for the antisatellite mission?

Dr. AIREY. It is technically much easier to deploy a ground-based, high energy laser weapon system for use against low earth orbit satellites than to deploy any space-based system. [Deleted.]

Senator WARNER. Dr. Airey, could you compare the obstacles which must be overcome before we can deploy a space-based, high-energy laser system with the obstacles that must be overcome to deploy the other kinds of high-energy laser systems you have described?

Dr. AIREY. From the standpoint of basic beam propagation limitations, a space-based laser weapon may be more attractive than a ground- or air-based one. In space there is no atmosphere to degrade the ability to focus the laser beam

onto a small spot on the target, and the vacuum of space provides the exhaust pump, readily permitting the operation of the laser cavity at low pressure or density. However, from an engineering standpoint, there clearly are difficulties. The system must be space-worthy from a reliability and a number of other standpoints, and it must be possible to check out its readiness without an undue consumption of the available fuels on-orbit. The requirement for accuracy in the pointing and tracking system is one to two orders of magnitude tighter for the space laser weapon than for the many ground-based mission applications, because of the long ranges involved. The primary focusing mirror must have a larger diameter than in a ground-based system, still keeping the required tolerance in the mirror surface figure. Also the power, weight, and volume requirements of the laser device for useful space applications are still well beyond the state-of-the-art, whereas for several ground-based systems this is not a serious issue.

Aside from the laser system itself, the supporting systems for surveillance, target acquisition, and command and control must be substantially more advanced for the space-based laser weapon than for the ground one. And depending upon the size of the space-based laser system, it may be necessary to develop a greater launch capability than present programs will provide.

SPACE LASER BATTLE STATIONS

Senator WARNER. Dr. Millburn, one can imagine many scenarios concerning space laser stations, but it is hard to imagine either of the superpowers tolerating a situation in which the other side's space lasers would be permitted to negate its offensive nuclear capability. One would assume that a nation wishing to attack another would first attack its space laser stations and if this were done with lasers the space war could be conducted very rapidly indeed.

Could you describe for this Subcommittee some of the more meaningful scenarios considered by the Space Laser Panel in its examination of the usefulness of space laser battle stations?

Dr. MILLBURN. Scenarios were considered separately as they related to utility and survivability of the laser system, although the two are obviously coupled. For the former, the important aspect is the vulnerability of prospective targets which might be defeated by the laser weapons. In the latter, the enemy assessment of the importance of the laser system defines the resources which might be committed and therefore drives the scenarios in which the laser stations must be defended.

As far as laser system utility is concerned, ballistic missile defense, anti-aircraft, antisatellite and defense of satellites were considered foremost. In the ballistic missile defense area, the most significant mission scenarios were damage-limiting ballistic missile defense against large attacks, defense of the National Command Authority and communications, command and control against pre-emptive SLBM attacks, defense against light attacks (e.g. Nth country or accidental), and defense of the land-based ICBM's in conjunction with conventional mid-course or terminal ballistic missile defense. The primary anti-aircraft scenarios of interest were defense of the United States from precursor or repeated attacks by Soviet based bombers, defense of the fleets from the same, interdiction of enemy airlifts, and suppression of Soviet airborne warning and control aircraft operating against United States strategic bombers. Tactical applications may also be of interest, but are characterized by higher density traffic and shorter flight paths which diminish the utility of laser systems. The antisatellite scenario of importance to laser weapons is one requiring very rapid negation of many enemy satellites. Although such situations can be imagined, none of these antisatellite scenarios seemed appropriate.

The scenarios associated with laser system survivability are varied. It is indeed difficult to imagine a situation where either superpower would tolerate significant quantities of laser stations which might threaten its aircraft or missiles and hence the strategic balance. There are many forms of attack which can be postulated including a miniature [deleted] vehicle (i.e. United States antisatellite system), space mine, ground-base laser, or nuclear antisatellite.

All of these are individually difficult to defend against, but none are conclusively devastating at the current stage of understanding. However, it is a point of fact that given sufficient resources, it has always been true that an attacker can devise means to overcome a defense. There is no reason to believe that space

lasers will be unique in being able to defend themselves on an absolute basis. The issue of survivability should be addressed more comprehensively in the future.

Senator WARNER. Dr. Millburn, is it unreasonable to assume that if space laser battle stations can be made invulnerable to attack from other space lasers, then systems can be designed to attack those space lasers using the same protective measures?

Dr. MILLBURN. If a space laser battle station can be hardened or shielded against laser radiation from another battle station, so could, in general, any other device or system designed to attack the laser battle station be hardened or shielded. However, the addition of hardening or shielding to any system will often impose a penalty in reduced performance capability or added cost. Threat hardening and laser survivability are major uncertainties identified by the Space Laser Study which should be addressed more comprehensively in the future.

Senator WARNER. Inherent in any consideration of space-based laser weapons is the likelihood that they may themselves be vulnerable to attack from anti-satellite missiles, space mines, and other high energy lasers based either on the ground or in space. The vulnerability of space-based lasers to attack is determined by the ability of the laser battle station to detect the attack, defend itself, and withstand conventional nuclear and laser damage.

Dr. MILLBURN. The survivability of the laser weapon system against a concerted enemy attack is a matter of concern. There is little doubt, that like most weapons systems, space-based laser battle stations could be destroyed by a dedicated attack. Analysis to date of survivability is limited, and this lack of analysis is a major caveat for all of the conclusions we have drawn.

Satellites are vulnerable to threats ranging from impact weapons to nuclear effects at long ranges. The space-based laser must be able to cope with these threats to survive. To accomplish this, the space-based laser must be able to employ all of the measures that other weapon systems use to minimize the impact of attacks, i.e., engage and destroy the attackers before they can cause damage, avoid the attackers, and design systems and deploy forces sized to be resistant to significant damage from credible threats. This complex interaction of forces has not been examined. However, certain comments can be made to address the case of a single laser battle station defending itself.

The existing Soviet [deleted].

A Soviet mirror image of the U.S. Miniature [deleted] Vehicle antisatellite weapon represents a greater threat, against even an operating space-based laser. The Miniature [deleted] Vehicle may be either air launched by a fighter aircraft or lofted with small boosters which would be much more difficult to detect than an ICBM or SLBM launch. Acquisition of the Miniature [deleted] Vehicle itself is difficult since it is small [deleted] and could approach from many aspects and during any portion of the space-based orbit. A Miniature [deleted] Vehicle could approach from a direction in which the space-based laser's sensors are blind and could be launched in salvos. Although the Miniature [deleted] Vehicle could readily be destroyed by the space-based laser if it were located in time, detection and acquisition are critical issues that have to be resolved.

Another threat to the space-launched laser is the "space mine" or "fellow traveler." This concept is a conventional or nuclear weapon launched into orbit accompanying the prospective target (the space-based laser battle station in this case). It would be possible to detonate the space mine on the basis of either ground command or autonomously. The space-based laser system's problem then would be to prevent the mine from ever getting within lethal range in the first place. Assuming that these mining tactics can be recognized when first employed near individual space-based laser stations, the U.S. would have to enforce a sterile zone around each space-based laser battle station.

Perhaps the most serious threat to the space-based laser battle station is a direct ascent, one-on-one, nuclear antisatellite, presumably heavily protected with an ablating heat shield to minimize the effective keepout range of a self-defending space-based laser. The issue in this case is the hardness level to nuclear weapon x-rays which can be achieved by the space-based laser system. The estimate is that battle station protection in the [deleted] range might be achieved, but the certainty of surviving against this exposure would have to be experimentally verified using extensive underground nuclear testing.

Finally, in direct attack, a laser antisatellite weapon must be considered. Those analyses made to date have generally made the assumption that the U.S. laser

battle station is more advanced and more capable than the Soviet battle station. This a priori assumption of U.S. superiority may not be reasonable. A ground-based laser antisatellite weapon may also be attractive as a counter to the space-based laser, but there has been inadequate analysis of this battle scenario to confirm this.

None of the aforementioned threats are conclusive, and the force-on-force aspects have not been adequately examined. However, the survivability of the space-based laser system against a concerted enemy attack remains a matter of major concern.

Senator WARNER. Dr. Millburn, what are the most difficult types of attacks for laser battle stations to withstand?

Dr. MILLBURN. Perhaps the most serious threat to the space-based laser battle station is the direct ascent, one-on-one, nuclear antisatellite weapon. A Soviet mirror image of the U.S. Miniature [deleted]. Vehicle would also be a threat, because of the difficulty of detecting its launch. It might also be launched in salvos.

SPACE LASER STATION VULNERABILITY TO ATTACK

Senator WARNER. Dr. Millburn, despite the vulnerability of space laser stations to many types of attack, is it not the case that with all-aspect sensors and all-aspect fields of fire for its lasers, the space laser could do a credible job of defending itself?

Dr. MILLBURN. Such capabilities would make the space-based laser battle station much more capable of defending itself. However, even an all-aspect sensor might have difficulty in detecting a small signature threat, such as the Miniature [deleted] Vehicle. Such scenarios have not been adequately analyzed to date.

Senator WARNER. Dr. Tanimoto, in your personal view could you describe for us what you believe are the key issues which we face in making a decision on whether or not to accelerate the space laser program?

Dr. TANIMOTO. The Secretary of Defense has not made a decision on whether or not to accelerate the space laser program. Our plans are to advise you of that decision when we send Congress our report on May 15, 1981.

However, in my opinion, the principal issue we face is the [deleted]. I believe that all other issues are simply specific uncertainties which will be addressed at whatever pace is selected.

The principal factor in determining [deleted]. This is the issue to be addressed shortly by the Secretary of Defense.

Senator WARNER. Dr. Tanimoto, could you describe what, in your own personal opinion, is the preferred program for acceleration of space laser development?

Dr. TANIMOTO. Although the space-based laser study group was generally able to agree on the facts in most areas, the individual judgments on the appropriate pace of development varied greatly. The views and reasoning of all concerned are being reviewed and I expect that the conclusions of the Secretary of Defense will be conveyed to the Congress in mid-May.

However, in deciding the pace of the program, I believe a prudent assumption is that the uncertainties will be resolved in favor of greater laser capability. [Deleted.]

I believe it would be prudent to make the investment to [deleted].

Such a program would be structured with milestones to permit a continuing assessment of progress before major new commitments of resources. It would cost approximately [deleted]. I should note that all cost estimates are in constant fiscal year 1981 dollars.

The program would contain four major thrusts:

A technical feasibility demonstration [deleted].

A comprehensive analysis and testing program to address, in detail [deleted].

[Deleted.]

An aggressive technology development effort to provide [deleted].

RISKS IN ACCELERATING SPACE LASER PROGRAM

Senator WARNER. Dr. Tanimoto, could you describe what, in your own opinion, are the risks associated with accelerating the space laser program?

Dr. TANIMOTO. The most recent studies by the Department of Defense have identified several major areas of uncertainty: technology readiness, overall sys-

tem engineering, target hardness to laser radiation, laser weapon survivability, resistance to countermeasures and cost. The Department's space laser technology program will ultimately have to address these uncertainties before accurate assessments of feasibility, cost and utility can be made.

However, in my personal opinion, there are several kinds of risk. Program acceleration can reduce risks as well as create them. Acceleration would actually reduce the risk of spending resources on unproductive paths by obtaining [deleted].

Investment in [deleted] is also an essential investment in resolving uncertainties. [Deleted.] It occurs well ahead of the resolution of issues, and the risk is substantially higher. It is also important to realize that one can risk the time gained in program acceleration by not maintaining a vigorous technology program to provide the growth potential to meet a responsive threat.

Finally, I would also like to note that there would be a substantial risk of failure to meet schedules and costs if we attempted to accelerate the program without the dedication, the sustaining resources, and the appropriate management approach.

Senator WARNER. Dr. Tanimoto, if the U.S. were to decide to commit to the earliest possible demonstration in space of a space laser weapon, how would we proceed, how much would it cost, and when would it be complete?

Dr. TANIMOTO. The earliest possible launch of an [deleted].

Senator WARNER. Dr. Tanimoto, in your personal opinion, if the U.S. were to decide now that it wanted to deploy a space-based, high-energy laser ballistic missile defense system, what would that system look like, how long would it take to deploy, and how much do you believe it would cost?

Dr. TANIMOTO. The answer to your question is strongly driven by assumptions that must be made both about the [deleted] system would be designed to achieve. In my personal opinion, I would see the deployment of a space-based high-energy laser [deleted]. These cost and schedule estimates have large uncertainties due to the lack of a more complete weapon construct and uncertainties in the level to which boosters can be hardened and in system integration, system survivability and lethality.

Senator WARNER. Today we received a briefing on four options with respect to space lasers—no change, enhancement of the technological base, an early experimental demonstration, and a prototype.

Dr. Millburn, what options other than the four briefed today were considered for acceleration of the space laser program?

Dr. MILLBURN. These are the only options that were examined in detail by the study task force, and for which cost and schedule estimates were made. Clearly, there are intermediate levels of effort between the options which could be chosen.

Senator WARNER. Dr. Wade, Dr. Zeiberg, Dr. Millburn, and Dr. Tanimoto, if the Congress were to decide that a space-based laser system is warranted which is larger than the [deleted] system frequently discussed, then does this alter the desirability of integrating systems into a [deleted] weapon prototype with increased reliability and life expectancy?

Dr. WADE. If it were decided that the first deployed space-based laser system should be a [deleted] system, or a larger one, there would still be a requirement for a space-based feasibility demonstration but not necessarily a [deleted] system. An eventual on-orbit demonstration is essential to obtaining inspace experience with a laser system. However, the characteristics and engineering goals of the demonstration could be different if the eventual weapon system were perceived as based on [deleted] element.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

Dr. TANIMOTO. I concur.

SPACE-BASED CHEMICAL LASER WEAPON SYSTEM

Senator WARNER. Dr. Wade, Dr. Zeiberg, Dr. Millburn, Dr. Airey, and Dr. Tanimoto, if the United States wishes to proceed in an orderly manner toward development of space-based weapon systems, is an early on-orbit demonstration built around the DARPA Triad a better approach than the present program, or would it be a costly technological stunt paralleling advances toward the actual system which would prove more cost effective?

Dr. WADE. If the the United States should decide that a space-based chemical laser weapon system could fulfill a mission need, then an on-orbit demonstration based on Triad technology is an essential step in its development.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

Dr. AIREY. I concur.

Dr. TANIMOTO. I concur.

HARDNESS OF SOVIET ICBM BOOSTERS

Senator WARNER. How hard do we believe Soviet ICBM boosters are, how hard are U.S. ICBM boosters, and how hard is it possible to make ICBM boosters before weight penalties become prohibitive?

Dr. ZEIBERG. Current boosters are relatively soft with vulnerability levels estimated on the order of [deleted] U.S. boosters are [deleted]. Hardening beyond these levels can be achieved by the addition of ablative coatings. [Deleted]. Using currently available materials the following hardnesses could be achieved [deleted].

These examples are for the [deleted]. Generally, rough cost-exchange estimates in this type of tradeoff strongly favor the offense because additional boosters/launchers are relatively inexpensive compared with space-based lasers. [Deleted.]

There is uncertainty at this time as to ultimately achievable hardness levels, largely due to lack of data and development and it is clear that we need to pursue this area aggressively. Given these uncertainties, the nominal range for service booster vulnerability for the time frame of a space-based laser system is [deleted]. Preliminary U.S. materials development programs are now working on materials that might support greater hardness.

Senator WARNER. Dr. Wade, Dr. Zeiberg, Dr. Millburn, could each of you comment on the potential cost effectiveness of using space-based lasers in the anti-ICBM, anti-SLBM, ASAT, DSAT and anti-bomber roles?

Dr. WADE. Although damage-limiting BMD is extremely demanding for a space-based laser system, defense against small numbers of unhardened or lightly hardened ICBM or SLBM is more readily achieved. Such missions might include defense against light attacks (e.g.: Nth country, accidental launch) or defense against SLBM attacks on the National Command Authority or Command, Control and Communications. The requirements for these are generally similar to those for an anti-aircraft system.

An anti-aircraft system could be deployed [deleted] with a total cost estimated on the order of \$50 billion. The major uncertainties in such a system are the surveillance and the laser system survivability. Because of these uncertainties, the large uncertainty in cost, and the difficulty in predicting the Soviet response (i.e.: the other side of the cost exchange equation), cost-effectiveness cannot reasonably be quantified. For example, the Soviet response might well be along the lines of any of the following: (a) jamming U.S. surveillance sensors, (b) attacking the space-based lasers or surveillance, (c) reduced dependence on aircraft, or (d) introduction of their own anti-aircraft laser system against the much greater U.S. dependence on aircraft (e.g.: airborne command posts, B-52s, tankers).

The ASAT role is possible with any of the laser levels under consideration. Again, cost-effectiveness is difficult to quantify for much the same reasons. However, it appears that space-based laser ASATs are probably cost-effective when compared with other means, only if rapid negation of many Soviet satellites is required.

The DSAT role is equivalent to self defense by the space-based laser. This area is one of great uncertainty. However, it does seem clear that a dedicated attack with sufficient resources will destroy any laser station.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

SPACE-BASED LASERS/TACTICAL AND STRATEGIC MISSIONS

Senator WARNER. Space-based lasers could have valuable tactical as well as strategic roles. Dr. Wade, Dr. Zeiberg, Dr. Millburn and Dr. Tanimoto, could you comment on those strategic and tactical missions where space lasers offer a truly unique capability?

Dr. WADE. The two mission applications in which space-based lasers have the potential for a truly unique capability are the anti-aircraft role and the ballistic missile defense role. In the anti-aircraft role, space-based lasers offer the potential to conduct such a mission around the globe without the necessity for forward basing fighter aircraft. In the ballistic missile defense role space-based lasers offer the potential for killing a ballistic missile with a non-nuclear kill in the boost phase, thereby preventing the fall of any nuclear materials on the U.S. homeland.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

Dr. TANIMOTO. I concur.

COST EFFECTIVENESS OF SPACE-BASED LASERS

Senator WARNER. Dr. Wade, Dr. Zeiberg, Dr. Millburn, and Dr. Tanimoto, could each of you identify those assumptions made in calculating the cost effectiveness of space laser systems to which the outcome is most sensitive and give us your own personal judgment as to what are reasonable values?

Dr. WADE. Because of the great cost uncertainties, it was found impractical to quantify cost-effectiveness of space-based laser systems. Cost estimates of systems are most sensitive to the target hardness, the laser-station redundancy required to achieve reasonable system survivability and availability, and the extrapolations in technology and engineering. The latter include not only the lasers but surveillance, aimpoint selection, pointing against dynamic targets, protection against the variety of threats, system control and resource allocation and the like. The size and complexity of the stations, compared to previous satellite experience, increases the cost uncertainty.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

Dr. TANIMOTO. I concur.

Senator WARNER. Dr. Wade, Dr. Zeiberg, and Dr. Tanimoto, in your opinion, is there a better way to organize military high energy laser programs other than the way we are doing it now, and if so, what would you recommend?

Dr. WADE. The Department of Defense believes the organizational structure and division of responsibilities of its high energy laser program fits the program we have today and the maturity of the technology.

Dr. ZEIBERG. I concur.

Dr. TANIMOTO. I concur.

NATIONAL LASER INSTITUTE

Senator WARNER. Dr. Wade, Dr. Zeiberg, Dr. Millburn, and Dr. Tanimoto, could you comment for the record on Senator Heflin's bill to create a "National Laser Institute?"

Dr. WADE. The Department of Defense is presently developing its position on Senator Heflin's proposed bill in response to his letter of February 24, 1981. Our position will be forwarded to the Congress through the established legislative channels.

Dr. ZEIBERG. I concur.

Dr. MILLBURN. I concur.

Dr. TANIMOTO. I concur.

STRATEGIC DEFENSE AND MX

Senator WARNER. Ballistic Missile Defense offers promise in addressing the ICBM vulnerability problem. Already the Army and the Air Force are working together to make the LoAD terminal BMD system compatible with the preferred MX mobile basing mode. Exoatmospheric intercept and overlay BMD systems might also permit us to defend fixed silos. Dr. Wade and Dr. Zeiberg, how important is it to develop a mobile ICBM when we might be able to solve the ICBM vulnerability problem with Ballistic Missile Defense?

Dr. WADE. Much of the effectiveness of the Low Altitude Defense (LoAD) results from the leverage arising from defending a mobile ICBM. The defense of fixed ICBM's that do not provide multiple aimpoints per missile is more difficult because the Soviets can concentrate their attack on fewer targets and require the defense to make multiple intercepts in defense of a single target.

The Overlay appears to be a very cost effective approach to the defense of fixed ICBM's [deleted].

Dr. ZEIBERG. Mobile basing of our ICBM force is the lowest risk approach available to us.

Senator WARNER. What are the potential weaknesses of BMD systems which cause concern that they alone may not be able to provide assured ICBM survivability?

Dr. WADE. BMD systems, particularly exoatmospheric systems, cannot be tested in the environment and under the conditions that they will face if activated. The sensors (either radar or long wave infrared optics), interceptors and the complex electronics will be exposed to high levels of combined nuclear effects that, in general, [deleted]. In addition, it is not practical to provide in any test the number and type of targets that a BMD system would observe. [Deleted] which could enhance their deterrent value. With regard to LoAD, our main concerns are the [deleted]. With regard to the Overlay, the basic concept is promising and limited test results give reasonable credence to the potential but many critical issues remain to be resolved. These include: [deleted].

Dr. ZEIBERG. BMD is still a high technology approach to providing ICBM survivability. There are risks that the as yet unproven technology will not be as effective as projected.

BMD SYSTEMS

Senator WARNER. Dr. Wade and Dr. Zeiberg, could you describe for this Subcommittee ways in which various BMD systems and mobile ICBM's reinforce the effectiveness of each other.

Dr. ZEIBERG. Basing a mobile ICBM in a multiple aimpoint mode, such as multiple protective structures, will require the Soviets to target every shelter to attempt to destroy the missile. If a BMD system is based similar to the ICBM, so its location is also unknown, and so it can defend the ICBM, the Soviets would have to target one additional reentry vehicle to each shelter for each intercept that can be made in defense of the ICBM. Thus, a single BMD intercept in defense of each ICBM would double the number of reentry vehicles the Soviets must have, two intercepts would triple the number of reentry vehicles required. For this multiplication to be meaningful there must be a relatively large number of shelters to start with. For example, if 200 missiles were fix-based, as is Minuteman, there would only be 200 aimpoints. If a BMD were to make one or two intercepts in defense of each aimpoint only 200 to 400 reentry vehicles would be required to exhaust the defense and an additional 200 reentry vehicles could destroy most of the ICBM's. The 400 to 600 reentry vehicles is a small fraction of the current and projected Soviet ICBM force. If the same 200 ICBM's were mobile and based in 4,600 shelters it would take 4,600 reentry vehicles to destroy most of them. If 200 mobile BMD systems were added and each made only one intercept the Soviets would require 9,200 reentry vehicles, if each BMD made two intercepts the Soviets would require 13,800 reentry vehicles. Thus by combining 200 BMD defense units with 4,600 shelters the defense units that could only extract a price of 200 to 400 reentry vehicles can extract a price of 4,600 to 9,200 reentry vehicles and the 4,600 shelters are effectively multiplied by two or three with no additional construction or land requirements.

Dr. WADE. In addition, by deceptively basing the BMD systems it becomes impractical for the Soviets to exploit specialized attacks to attempt to overwhelm the defense with nuclear precursor bursts, and some electronic countermeasure attacks, as was possible in the Safeguard system.

Senator WARNER. Dr. Wade and Dr. Zeiberg, could each of you describe for this Committee the kind of Ballistic Missile Defense program you would recommend if the MX program were suddenly canceled?

Dr. WADE. The major focus of our BMD program for the last ten years has been to develop and validate the technology and concepts to provide options for the defense of the land-based ICBM force. In the last two years we have placed emphasis on LoAD, in particular for MX defense, because it appeared to offer a high payoff. However, we have maintained some of our technology base work, the Overlay work, and have just completed the System Technology Radar validation, which would support a Site Defense type of system. The exact structure and emphasis of the BMD program would depend on the basing of the ICBM force but the overall objective should remain to assure that we have available defensive options based on modern technology and to attempt to reduce the lead time required to exercise any of those options.

Dr. ZEIBERG. I agree with Dr. Wade.

VULNERABILITY TO PENAIDS AND LARGE THREATS

Senator WARNER. General Tate, could you comment on the vulnerability of LoADs and exoatmospheric intercept systems to decoys, penetration aids, and increased numbers of warheads?

General TATE. Both LoAD and the exoatmospheric Overlay concept are being designed to perform effectively in an environment that includes large numbers of reentry vehicles (RVs) accompanied by decoys and other penetration aids. LoAD will track and engage the threat at very low altitudes taking advantage of the atmospheric deceleration to separate lightweight decoys and booster tank fragments from RVs. The denser, more sophisticated decoys will still be credible penaids at LoAD altitudes; these are included in the baseline LoAD threat and effective discrimination techniques are being developed from them. In advancing BMD capability, maximum benefit is being obtained from experience with previous BMD programs (e.g., Safeguard, Site Defense).

The addition of LoAD to MX in multiple protective shelters (MPS) is a cost-effective solution to extend US ICBM survivability in the event of unconstrained Soviet threat growth. An intercept of a single RV per MX would require the attacker to double the attack level in order to insure killing the MX. LoAD is designed to be very effective in protecting MX against threat levels up to one RV per shelter.

The Overlay system will intercept attacking RVs at long range and above the atmosphere using autonomous interceptors with multiple optically-homing kill vehicles carrying nonnuclear warheads. Efforts are underway to advance effective optical discrimination techniques to distinguish RVs from penaids exoatmospherically; analytical and simulation results are being verified through flight experiments. Ongoing programs which advance the capability to perform BMD in the exoatmosphere include the Homing Overlay Experiment (HOE) to demonstrate exoatmospheric optical homing and nonnuclear kill and Designating Optical Tracker (DOT) to demonstrate the use of optics to perform the BMD functions of acquisition, discrimination, designation, and track. The most recent DOT flight confirmed theoretical expectations as to the capability of employing optics to [deleted].

Data gathering programs are planned and funded that will enhance the [deleted]. These data will provide greater confidence in the ability to [deleted] and to conduct the BMD functions (i.e., acquisition, discrimination, designation, track, and engagement).

The Overlay concept, employing multiple kill vehicles per booster, is a cost-effective defense—even against MIRVed ICBMs. It is an attractive solution for defense of a variety of targets including SAC bases, command and control centers, ICBMs, and other high value military assets. In case of extremely large threat levels, the Overlay can be combined with an Underlay, such as LoAD, to provide a low-leakage defense of US ICBMs.

SURVIVABILITY OF LOAD AND OVERLAY DEFENSE

Senator WARNER. General Tate, could you comment on the survivability and endurance of LoAD and exoatmospheric intercept systems in the central nuclear exchange?

General TATE. LoAD survivability depends on preserving defense unit (DU) location uncertainty and designing LoAD to an adequate nuclear hardness. Both of these aspects of LoAD design are engineering problems which should be successfully resolved with existing or near-term technology.

Preservation of Location Uncertainty (PLU) will be assured by adopting the PLU operating procedures developed for MX and by designing LoAD to [deleted.] The Air Force has a large and extensive program underway to insure PLU for MX. The Army will take advantage of this work and conduct its own LoAD PLU program to insure that PLU for LoAD is maintained as well. For example, LoAD defense units must break out of the shelters in order to perform their defensive functions; and after breakout, it is no longer possible to maintain PLU for the LoAD DUs. [Deleted].

It is also theoretically possible for the offense to eventually locate the DUs and kill them in a subsequent exhaustion attack. Afterward, the remaining surviving shelters could be attacked with the knowledge that they are undefended. However, such an attack scenario is technically very difficult to accomplish and would entail acceptance of the risk that MX might be launched between attacks. Therefore, it is not considered a viable option for an attacker.

Once a D-U's radar and interceptor canister break out through the top of their shelter in battle, they must be able to survive the intense environment of nuclear effects (e.g., blast, shock, heat, dust erosion, debris, electromagnetic pulse, radiation) created by nearby bursts until they have fulfilled their mission. In terms of time, the endurance required is extremely short. LoAD will acquire, discriminate, and intercept RVs in [deleted]. But in physical and technological terms, it is the most stressing of the requirements. Therefore, the nuclear hardness of LoAD is also being given a high priority in LoAD design. The decision last year to reduce the MX shelter spacing from 7,000 to [deleted] feet significantly impacted LoAD. It appears, however, that the [deleted].

Another survivability issue is that the LoAD DU be able to defend itself if it is attacked by a [deleted] RV before the shelter housing the MX. The LoAD DU contains three interceptors to assure this capability [deleted].

Survivability for the exoatmospheric intercept system appears to center on nuclear hardness. However, the environment should be less severe than that expected for LoAD. The design of the exoatmospheric intercept system incorporates nuclear hardness levels which should assure survivability. These techniques include hardened silo basing (to survive attempted defense suppression attacks), hardened sensor and data processor, and hardened interceptor guidance system. This hardening will insure survivability and endurance of the exoatmospheric intercept system in the central nuclear exchange.

BMD COUNTERMEASURES

Senator WARNER. General Tate, how can you be confident that very expensive BMD systems cannot be turned into white elephants by countermeasures employed by the attacker?

General TATE. BMD programs are currently underway to examine the impact of all near-term and the more plausible far-term countermeasures against BMD. Continuing studies are being conducted of the impact on BMD of [deleted]. The current Low Altitude Defense (LoAD) program within BMD takes full advantage of technology validated during the Site Defense program and STVP.

Another flight program is the Designating Optical Tracker (DOT) program which has been demonstrating the capability of long wavelength infrared (LWIR) sensors to perform the BMD functions of threat acquisition, designation, target discrimination, and tracking in a realistic geometric engagement and environment. The most recent flight confirmed theoretical expectations as to the capability of employing optics to [deleted].

In addition, data gathering programs are planned and funded within BMD that will provide [deleted]. Such programs include the Optical Aircraft Measurements Program (OAMP) and the [deleted] program. Data from these programs will provide greater confidence in the ability to [deleted] and to conduct the BMD functions (i.e., acquisition, designation, discrimination, track, and engagement).

In addition to studies, analyses, simulations, and flight tests conducted to provide confidence in system performance growth paths are designed into each BMD system concept to insure it can handle threat excursions. For example, the very short operating ranges of LoAD have made it possible to incorporate additional radar power at an affordable cost. Thus LoAD has a substantial "electronic countermeasures (ECM) margin" since the radar has approximate [deleted]. For a terminal defense system, [deleted]. Distributed data processing is an emerging technology and its use in BMD systems (e.g., LoAD) provides significant data processing growth potential to handle large numbers of threat objects associated with threat evolutions.

LOADS AND OVERLAY ACCELERATION

Senator WARNER. General Tate, could you describe for this subcommittee moderate and maximum acceleration programs for LoADs, exoatmospheric intercept, and overlay systems?

General TATE. The LoAD program is being accelerated through funding increases in the form of a fiscal year 1981 supplemental of \$39M and a fiscal year 1982 amendment of \$90M which are being submitted to Congress. These increases in funding will place the LoAD program on an accelerated schedule to allow completing the Phase I Preprototype Demonstration (PPD) program in [deleted]. This schedule represents moderate program acceleration. The RDTE costs of this LoAD PPD program by fiscal year are as follows:

	<i>Millions (then year)</i>
PPD program :	
Fiscal year 1980.....	\$20
Fiscal year 1981.....	90
[Deleted]	[Deleted.]

An additional \$1.50B will be required to complete Phase II PPD (which could run concurrently with the last two years of Phase I) and engineering development (ED).

Maximum acceleration of LoAD provides for entry into [deleted] and would support an [deleted] FOC would be in [deleted] which is concurrent with MX FOC. The RDTE costs (including ED) of this option are as follows:

	<i>Millions (then year)</i>
Eng Dev Prog :	
Fiscal year 1980.....	\$20
Fiscal year 1981.....	90
[Deleted]	[Deleted.]

The present exoatmospheric Overlay program does not address all critical issues and will not lead to an IOC before the mid to late 1990s. A moderate acceleration of the Overlay program would be to increase funding to address these critical issues, enter [deleted] and provide the option for a deployment [deleted]. The following budget allocation represents the funding required for this Overlay development schedule (ED RDTE costs are not included but through [deleted] in then-year dollars):

	<i>Millions (then year)</i>
Fiscal year 1981.....	\$92.0

At a slightly higher technical risk and at maximum acceleration, an exoatmospheric Overlay defense could [deleted]. This Overlay system would be [deleted]. The acquisition costs for defense against a constraint threat, in constant fiscal year 1980 dollars, would be roughly [deleted].

RISKS ASSOCIATED WITH PROGRAM ACCELERATION

Senator WARNER. General Tate, could you describe for this subcommittee the technological and operational risks associated with major acceleration of the BMD program?

General TATE. Major systems thrusts within BMD include Low Altitude Defense (LoAD) and Overlay defense. There are no major technical or operational risks associated with acceleration of the LoAD program. LoAD is based on well defined technology most of which has been demonstrated in previous programs such as Safeguard and Site Defense. Among critical technological and operational issues associated with LoAD are the following:

[Deleted.] The currently planned LoAD PPD program, with the supporting technology and field data acquisition programs, is structured to resolve these issues.

Whereas LoAD represents low risk technology, the Overlay concept represents less mature technology. There are major critical issues associated with the Overlay which must be resolved through demonstration in a system context. Among the critical issues are the following: [Deleted.] Separate ongoing technology programs are structured to resolve certain critical issues associated with Overlay defense. Such programs include Homing Overlay Experiment (HOE) to demonstrate exoatmospheric optical homing and non-nuclear kill; Designating Optical Tracker (DOT) to demonstrate the use of optics to perform detection, discrimination, and designation; and Forward Acquisition System (FAS) to demonstrate the use of an onboard LWIR sensor for BMD and early warning.

The technological risks associated with major acceleration of the Overlay portion of BMD include the [deleted]. The achievement of that required capability may involve technologies and materials that are just emerging from the laboratories and will have to be weaponized. The [deleted]. In addition, the [deleted]. The use of a nonnuclear warhead and solid propellant boosters will ease operational requirements and reduce operational risks.

Another major area of effort within BMD, conducted primarily within the Advanced Technology Center, is the advancement of the state-of-the-art in crucial BMD technologies such as endoatmospheric nonnuclear kill, use of lasers for BMD, onboard optical sensors, etc. It is an objective of these advanced technology

efforts to mature those technologies that will provide significant advances, perhaps quantum improvements, in BMD system capability. The pace of BMD technology advancement can be substantially increased through an enhanced program.

ACCELERATION OF BALLISTIC MISSILE DEFENSE

Senator WARNER. Dr. Wade, Dr. Zeiberg and General Tate, given the similarity of many BMD technologies to technologies employed in other programs, could you comment on the industrial feasibility of a major acceleration of BMD?

Dr. WADE. The industrial base to support the acceleration of BMD Demonstration program appears to be available. The technology required in most areas is mature and a number of contractors are competing for the component development contracts, drawing on experience from programs with similar requirements. Even in areas that are unique to BMD requirements, such as the interceptor motor, the BMD Advanced Technology Programs have maintained an adequate industrial base. Our major concern is with the production phase of a BMD deployment if a decision to deploy is made. We believe the industrial resources can be available given adequate lead time to prepare, probably at least [deleted]. In addition, the [deleted].

The Overlay technology is less mature. There is a sufficient industrial base to support the required research and development. However, there [deleted].

Dr. ZEIBERG. In the case of LoAD, and probably with the Overlay, there is sufficient time before a system development can be completed to obtain the facilities needed for production; however, the commitment of resources to obtain these facilities must be made with sufficient lead time.

INDUSTRIAL FEASIBILITY OF BMD ACCELERATION

Senator WARNER. Dr. Wade, Dr. Zeiberg, and General Tate, given the similarity of many BMD technologies to technologies employed in other programs, could you comment on the industrial feasibility of major acceleration of BMD?

General TATE. Major system thrusts within BMD include Low Altitude Defense (LoAD) and the Overlay defense concept. LoAD is being developed as a generic defense for MX in multiple protective shelters (MPS) or as the Underlay portion of a two-tier layered defense of either MX or Minuteman. Both efforts are in the R&D phase of development. Major acceleration of these programs would be industrially feasible; there are adequate qualified contractor personnel available to support accelerated programs. Many of these personnel already have a broad-base of BMD expertise from past experience on BMD programs and would require a minimum phase-in period. LoAD is currently in the Preprototype Demonstration (PPD) phase of development; the option is available to accelerate completion of LoAD R&D and provide for earlier deployment. The Overlay effort, which relies on less mature technology than LoAD, could benefit appreciably from a major acceleration in that the critical issues, which must be demonstrated through flight experiments, could be resolved much earlier than currently planned. Also, the [deleted]. Major acceleration of Overlay is feasible; the industrial support to conduct the necessary R&D can be assembled.

Another thrust within the BMD program is the advancement of the state-of-the-art of relevant BMD technologies associated with current and future defense concepts. Acceleration of this technology base development is industrially feasible and would allow for the incorporation of new technologies (which have the potential to provide significant improvements in BMD system cost effectiveness) into current and future BMD system concepts. Such technologies include LWIR optical sensors for acquisition, discrimination, designation, and track; endo-atmospheric non-nuclear kill; and the BMD applications of lasers.

The industrial feasibility of major acceleration of BMD production schedules depends upon obtaining adequate preparation leadtime [deleted] prior to production. There is concern, relative to LoAD acceleration, in that [deleted.] Acceleration of production of Overlay components must be accompanied by an [deleted].

HOMING OVERLAY EXPERIMENT (HOE)

Senator WARNER. General Tate, could you describe for this committee the Homing Overlay Experiment and its importance?

General TATE. The exoatmospheric Overlay defense concept is a high thrust systems effort within BMD. The Overlay will involve the use of long range in-

terceptors carrying multiple optically homing kill vehicles and nonnuclear warheads. The use of multiple kill vehicles per booster provides defense leverage in an offense-defense exchange. The Overlay concept is applicable to defense of a variety of targets such as SAC bases, command and control centers, and other high value military assets as well as ICMBs. The Homing Overlay Experiment (HOE) is essential to the Overlay program because it will [deleted]. The HOE program will include [deleted] as indicated by the following milestone schedule:

Program initiation	Preliminary review design	} Deleted.
Fiscal year 1979	1980	

Target vehicles will be launched from Vandenberg AFB, California, and the HOE interceptors will be launched from Kwajalein Missile Range (KMR). The HOE program will evaluate [deleted]. The data which evolves from this program will provide [deleted]. This data will also provide the data base and test bed for the development of exoatmospheric systems which [deleted].

NONNUCLEAR KILL (NNK)

Senator WARNER. General Tate, could you describe for this committee the significance on non-nuclear kill mechanisms for exoatmospheric intercept.

General TATE. In addition to increased public acceptance of a BMD deployment the development of a nonnuclear kill (NNK) capability will provide significant improvements in BMD system cost-effectiveness. Advantages of NNK defense capability include the following: ease of interceptor transport and deployment, no nuclear release requirement, no critical nuclear material limitation, no self-inflicted nuclear blackout, greater testing flexibility during R&D and deployment, and greater siting flexibility. Also, it is possible to positively demonstrate actual RV kill by flight tests. Although NNK technology is relatively more mature in the exoatmosphere than in the endoatmosphere, these advantages apply to both regimes.

ASAT CAPABILITY

Senator WARNER. General Tate, could you tell this committee what the ASAT capability of your exoatmospheric intercept program would be and whether or not an accelerated program aimed at an early ASAT capability is possible? If so, could you provide us with a funding profile?

General TATE. The mission of BMD does not presently include ASAT. This mission has been delegated to the Air Force and any thrust by BMD into the ASAT area would require a change in present BMD mission statements.

The development of an exoatmospheric Overlay defense is a major systems thrust of the BMD program. The Overlay will accomplish exoatmospheric intercept of attacking reentry vehicles (RVs) at long-range using autonomous interceptors with multiple kill vehicles and nonnuclear warheads. Since the Overlay is conceived as a defense against ballistic missiles, it is being optimized to intercept RVs flying a ballistic trajectory; therefore, the capability of the present design in an ASAT role would be limited. Nevertheless, [deleted].

As part of the Overlay program, BMD is planning a series of [deleted] at the Kwajalein Missile Range. The purpose of HOE is to resolve the key development issues associated with exoatmospheric homing and nonnuclear kill [deleted]. The technology of the HOE and ASAT-type interceptors is much the same; however, the performance requirements are significantly different. The HOE interceptor, for instance, uses predefined intercept points, known target launch times, known target characteristics, etc., which are not compatible with an ASAT role. [Deleted.] A funding profile [deleted].

FORWARD ACQUISITION SYSTEM (FAS)

Senator WARNER. General Tate, do you believe that the Forward Acquisition System would be a [deleted].

General TATE. Yes. The Forward System (FAS) can be applied to the [deleted]. Early impact point predictions are associated with large uncertainties which take the form of large error ellipses around the predicted impact. As [deleted]. While the [deleted].

FORWARD ACQUISITION SYSTEM (FAS) PROGRAM ACCELERATION

Senator WARNER. General Tate, could you advise this Committee on the funding profile which would accelerate at a moderate rate the Forward Acquisition System for an [deleted].

General TATE. The following additional funding profile would permit moderate acceleration of the Forward Acquisition System (FAS) to provide [deleted].

	<i>Millions (then year)</i>
Fiscal year 1981.....	\$30
[Deleted].....	[Deleted.]

This program includes the design, development, fabrication, test, and acquisition of [deleted] after Authorization to Proceed and the [deleted]. The [deleted].

FORWARD ACQUISITION SYSTEM (FAS) DATA PROCESSING REQUIREMENTS

Senator WARNER. General Tate, could you comment on the magnitude of the data processing effort associated with the Forward Acquisition System and tell us what improvements you think are necessary and possible in this area?

General TATE. The Forward Acquisition System (FAS) data processing throughput requirement is on the order of [deleted]. These capabilities are well within the current state-of-the-art utilizing micro-processors in a distributed data processing arrangement. In addition, the data processing packaging requirements (weight, volume, power) can be accommodated using current technology. The current FAS program encompasses the design of a tactical signal and data processor to be utilized in an integrated ground test program, including sophisticated simulation techniques. There is currently [deleted].

AVAILABILITY OF NUCLEAR MATERIALS FOR LOAD

Senator WARNER. General Tate, could you comment for the record on the availability of [deleted] for deployment of the LoAD system to protect from 200 to 400 ICBMs?

General TATE. LoAD is a cost-effective option for a stand-alone defense of MX in multiple protective shelters or as the Underlay portion of a two-tier layered defense of ICBMs in silos. In either case [deleted]. Furthermore [deleted].

The BMD Program Manager formed a LoAD Warhead Selection Working Group in the fall of 1979. This group has been working closely with DOD, DNA, and DOE. During the Phase I (Concept Formulation) portion of the warhead selection process, which has been completed, the warhead performance requirements were determined and a set of candidates was identified. [Deleted.] These candidates have [deleted].

INNOVATIVE, LOW-COST BMD CONCEPTS

Senator WARNER. General Tate, what has the Army done to study innovative, low cost BMD techniques and what are the conclusions?

General TATE. The BMD Advanced Technology Center has been engaged in a continuing search for low-cost innovative BMD concepts that could be produced and deployed rapidly in defense of ICBMs. About 20 concepts have been seriously considered and a vigorous screening process has been used to select attractive concepts for further consideration.

Among the concepts considered is a [deleted].

Many of the simple, novel concepts simply did not work as advertised and many were very limited in that defense effectiveness was easily overcome by offense tactics. [Deleted.]

Current investigation of simple, novel BMD concepts includes a [deleted]. It appears that this concept has greater BMD cost-effectiveness potential than previous concepts considered. New ideas for simple, novel approaches to BMD are continually emerging; attractive concepts will be evaluated.

INNOVATIVE BALLISTIC MISSILE DEFENSE

Senator WARNER. Dr. Wade and Dr. Zeiberg, could each of you comment on what you believe are the innovative BMD techniques offering the most promise?

Dr. ZEIBERG. Of all the innovative concepts that have been examined, none has been judged to be worthy of development. Many were found to be unworkable; some could make one intercept but no more. In the case of Minuteman silo defense, which has been the primary focus, a single intercept would raise the Soviet requirement for reentry vehicles to destroy Minuteman from 2,000 to 3,000, [deleted]. The small, guided, impact kill interceptors that the BMD Advanced Technology Center is presently investigating appear promising but they are more complex than most previous concepts and the studies have not progressed too far yet.

Dr. WADE. We continue to seek and evaluate new concepts but the prospects of finding a simple solution to the BMD problem do not appear encouraging. Yet, in my view, new innovative concepts are not required. The technology now available for an effective terminal defense of our strategic land-based assets is here today. What is needed is to move out and demonstrate this judgment of mine.

Senator WARNER. Dr. Wade, Dr. Zeiberg, General Tate, could each of you comment on the cost effectiveness of the Swarmjet ballistic missile defense program which would employ large numbers of unguided high-velocity rockets to defend ballistic missile silos.

Dr. ZEIBERG. Swarmjet is an example of one of the innovative concepts that, if it works, will probably be [deleted]. Swarmjet could at best offer some marginal protection for Minuteman for a few years after it was deployed. We have reviewed the Army's and the contractor's analyses of Swarmjet and agree with the Army's conclusion that their available resources are better applied to concepts with more potential.

Dr. WADE. Upon completion of the MX review we intend to review the BMD programs, particularly options for silo defense. We will include in that review the determination of what, if any, role innovative concepts, such as Swarmjet, may play.

Senator WARNER. Dr. Wade, Dr. Zeiberg and General Tate, could each of you comment on the cost effectiveness of the Swarmjet ballistic missile defense program which would employ large numbers of unguided high velocity rockets to defend ballistic missile silos?

General TATE. The Swarmjet system concept consists of [deleted].

The Swarmjet weapon technology investigation within BMD was [deleted] of the cost-effectiveness of the weapon for defense applications. The BMDO concluded that a [deleted].

To effect RV kill with the Swarmjet system, [deleted] requirement, it is essential that the [deleted]. To meet this [deleted].

BMD'S MOST SIGNIFICANT ACCOMPLISHMENTS

Senator WARNER. General Tate, what would you say have been the BMD program's most significant accomplishments in recent years?

General TATE. During the Safeguard era, it was convincingly demonstrated in the Sprint and Spartan interceptor test firings that lethal intercepts of reentry vehicles (RVs) were possible using nuclear warheads. The real questions of BMD feasibility (vis-a-vis Safeguard) centered on traffic handling capability (the size of the threat), vulnerability and cost of BMD radars, and discrimination capability (the ability to differentiate between RVs and decoys).

Since Safeguard, the BMD R&D program has greatly expanded the technology capability of BMD and has designed innovative system concepts which take advantage of this new technology. For example, as a result of advances in high frequency techniques and micro-electronics, the size and unit cost of BMD radars and data processors have been substantially reduced. Furthermore, BMD systems have evolved which [deleted] and deceptive basing and exoatmospheric interceptors employing multiple non-nuclear kill vehicles to provide favorable cost-exchange ratios, even for very large threat levels.

Through the Site Defense Program and the follow-on Systems Technology Validation Program (STVP), the BMD program has validated that BMD will work and that it is indeed a feasible strategic defense option. Resolution of the major critical issues associated with Site Defense represents a major advance in BMD system technology validation and provides high confidence that a terminal defense system can be successfully developed. As a result, Site Defense is essentially an "on-the-shelf" system.

Under the STVP, the Site Defense radar and a commercial data processor as well as tactical applications software were installed in a Systems Technology Test Facility (STTF) at the Kwajalein Missile Range (KMR). Resolution of the following critical issues was demonstrated through 48 live tracking missions—44 Minuteman targets of opportunity and 4 dedicated targets.

Bulk filtering to substantially reduce threat traffic.—The bulk filter eliminated [deleted] of the hundreds of pieces of tankage without putting them into track, thus reducing required radar and data processing resources. The STVP has proved conclusively that the bulk filtering technique can effectively eliminate clutter from the threat cloud and thereby reduce the traffic to a manageable level.

Discrimination of reentry vehicles (RVs) from clutter and penetration aids.—Out of more than 150 tries at discrimination on an actual RV or decoy, the radar and data processor classified the object correctly more than [deleted] of the time. In addition, signature data were gathered to validate simulations and prove that [deleted].

Demonstration of a real-time software.—The STVP together with the Safeguard program have proved conclusively that effective BMD software can be developed within reasonable time and at reasonable cost.

Operation in unmanned and dormant modes.—The STVP has demonstrated that a BMD radar can be activated from dormancy [deleted] without any manual testing and adjustment and then conduct an engagement of an incoming RV. Furthermore, on all 48 missions the radar and data processor were operated in a fully automatic mode without manual supervision. Collectively these tests provide high confidence that both unmanned and dormant modes of operation can be achieved.

Another major accomplishment in recent years has been the definition of the Low Altitude Defense (LoAD) system and the formulation of a program to technically validate that system. This effort has been driven largely by compatibility requirements with deceptively based MX (originally in trenches, then vertical shelters and now horizontal shelters). The definition of LoADs has involved the incorporation of everything that was learned in Safeguard and Site Defense programs and the adoption of the latest technology emerging from the BMD Advanced Technology Program. Therefore, it constitutes a system that is based on both proven BMD principles and techniques and innovative technology that strengthens the capability to perform critical BMD functions. LoAD components (interceptor, radar, and data processor) can be configured either to defend MX in multiple protective shelters or to serve as the Underlay in a two-tier layered defense system. LoAD is currently in the system design phase of a Preprototype Demonstration (PPD) program which was initiated in December 1979. The LoAD PPD program is on schedule, the contractor structure is in place, system design specifications have been developed and key interfaces have been established (e.g., Air Force Ballistic Missile Office, Defense Nuclear Agency, Department of Energy). The PPD program is scheduled for completion in [deleted] and will provide the option for [deleted].

The exoatmospheric Overlay is another high thrust systems effort within BMD. The exoatmospheric Overlay system is an accomplishment in two ways: it has been synthesized into a system (layered defense) that provides cost-effective defense of fixed sites against large threats; and it embodies a number of advanced techniques coming into maturity in the 1980s that, working together, provide the significant attributes of exoatmospheric non-nuclear kill. The Overlay concept definition within BMD has resulted from several key technology developments over the past decade. These include principally the development of long wavelength infrared (LWIR) optics for long-range exoatmospheric detection and tracking, advanced miniaturized data processing to handle large volumes of data, and homing and guidance techniques which permit the use of non-nuclear warheads.

The Overlay defense concept represents a significant advance in BMD system capability. The long reach of the Overlay system provides certain advantages; these include a relatively long period to observe and analyze the threat before committing kill vehicles, large coverage per site which results in low system cost, and high system leverage through the use of preferential defense and multiple kill vehicles. The Overlay is an attractive solution for defense of a variety of targets including SAC bases, command and control centers, ICBMs, and other high value military assets. In case of extremely large threat levels, the Overlay can be combined with an Underlay, such as LoAD, to provide a low-leakage layered defense of US ICBMs.

Substantial laboratory and simulation data have been acquired and some of the basic field testing has been successfully completed enough to provide confidence in the potential of the Overlay technology. A major accomplishment of the Overlay program has been the three successful Designating Optical Tracker (DOT) flights. All three flights have demonstrated that LWIR optical sensors can perform the BMD functions of acquisition, designation, discrimination, and track in a realistic environment. [Deleted.] Each flight has been designed to expose the LWIR sensor to successively more complex threat environments. Measurement data has been obtained on [deleted]. This data base is used to evaluate LWIR sensor performance capabilities for BMD and to refine and develop future test programs.

In addition to DOT, the Homing Overlay Experiment flight tests will advance the capability to perform BMD in the exoatmosphere by demonstrating exoatmospheric optical homing and non-nuclear kill. The HOE preliminary and critical design reviews have been successfully completed and design of all necessary hardware and software is proceeding on schedule for the [deleted]. Other ongoing supporting programs include Forward Acquisition System to demonstrate the use of an onboard LWIR sensor for BMD and early warning, and [deleted].

Other recent specific technological and system related accomplishments include: Development and ground testing of a [deleted].

Advances in radar antennas which have allowed for a weight reduction in subarray modules of 75 percent and a cost reduction of 50 percent.

Advances during recent years in computer and software technology which have provided high performance computers that are one-tenth the physical size and one-fifth the cost of their earlier counterparts.

FUTURE PROBLEMS

Senator WARNER. General Tate, what are the major problems which must be addressed in future BMD programs?

General TATE. The major problems that must be addressed in future BMD programs stem from the evolution of the strategic threat, with solutions constrained by national policy and the rate of technology growth. These problems include achieving maximum effectiveness from the limited resources available for near-term system development and establishing technology capabilities that offer an effective response to potential threat evolutions.

Although the strategic threat could evolve in a manner that includes other potentially hostile countries, the Soviet threat will continue to be the technology driver for the US BMD Program. The near-term Soviet strategic threat can evolve in three ways—quantity, quality, and force structure, each of which generates its own peculiar set of problems and BMD solutions.

Quantity.—Projections of the increase in quantity are straight forward and the impact is relatively easy to assess. The responses to large threats include higher defense system inventory and development of advanced systems that are less sensitive to threat size.

Quality.—The quality of the ballistic missile threat can be [deleted]. Responses to these qualitative improvements include new systems or tactics [deleted].

Force Structure.—A highly probable trend in the Soviet force structure is [deleted].

Major system efforts within BMD currently include Low Altitude Defense (LoAD) and Overlay defense. LoAD is in the system design phase of development. Technological problems within LoAD which must be solved include the following: [Deleted.]

These problems represent areas of increased emphasis within the LoAD program. Although there is a significant amount of work to be done, there are no problems which cannot be resolved with LoAD schedule.

LoAD represents technology most of which has been proven during the Safeguard and Site Defense programs but the Overlay concept represents less mature technology. Problems associated with the Overlay include the following:

[Deleted.] Ongoing programs within BMD are addressing some of these problems. The Homing Overlay Experiment (HOE) will demonstrate the capability to do LWIR optical homing and non-nuclear kill. Designating Optical Tracker (DOT) will prove that threat acquisition, discrimination, designation, and track can be performed optically. Forward Acquisition System (FAS) will demonstrate the use of an onboard LWIR sensor for BMD [deleted].

ABM TREATY

Senator WARNER. I would like to have entered in the record the full text of the ABM Treaty and I would like Dr. Wade to comment for the administration on the implications of the ABM Treaty for the BMD and laser programs we are pursuing.

Dr. WADE. The ABM Treaty severely limits the deployment of conventional BMD systems employing interceptor missiles and radars. Both the U.S. and the U.S.S.R. are limited to the deployment of no more than 100 ABM interceptor missiles and launchers. The U.S. has elected to designate the Minuteman field at Grand Forks AFB, North Dakota, as its BMD deployment area and could deploy up to 20 radars there. The Soviet Union has elected the Moscow area as its deployment area and could deploy up to six radar complexes in that area. These are not sufficient quantities to provide a significant defense for either side. On the other hand, the Treaty places very few limits on research and development (no development, testing or deployment of: (1) sea-based, air-based, space-based or mobile land-based ABM systems or components; (2) rapidly reloadable ABM launchers or ABM launchers capable of launching more than one interceptor at a time; and (3) ABM interceptors capable of delivering more than one independently guided warhead). In this context BMD components are considered to be ABM interceptor missiles, launchers, and radars, or components capable of substituting for them. The Treaty provides for a Standing Consultative Commission (SCC) to consider among other factors, questions of compliance, possible changes in the strategic situation which have a bearing on the provisions of the Treaty, and possible proposals for amendments to the Treaty. In addition, the Treaty is to be reviewed at five-year intervals; however, amendments can be proposed through the SCC at any time. The Treaty is of unlimited duration but either side can withdraw with six months notice if it decides that its supreme interests are jeopardized.

With regard to our BMD programs, we can resolve most of the key issues associated with establishing the feasibility of the concepts under consideration within the limits of the Treaty. If we determine that we want to proceed with engineering development of either the LoAD or Overlay concepts it would be necessary to, at some point, negotiate modifications to the Treaty or to withdraw. [Deleted].

The ABM Treaty constrains deployment, and to a lesser extent development, of space-based laser weapons. High energy laser research programs are not constrained by existing arms control agreements. The ABM Treaty does ban the development, testing, and deployment of all ABM systems and components that are sea-based, air-based, space-based, or mobile land-based. The Treaty permits the development and testing of fixed, land-based ABM systems and components based on other physical principles (such as lasers and particle beams), and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars. However, the Treaty prohibits the deployment of such land-based systems and components unless the Parties consult and amend the Treaty.

Only the actual use of space-based laser weapon systems to interfere with Soviet satellites used to verify compliance with testing, or deployment of systems that could be used in such roles—is prohibited under the provisions of the ABM Treaty (Article XII), and the SALT I Interim Agreement (Article V), and the SALT II Agreement (Article XV).

The full text of the ABM Treaty follows:

TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS

Signed at Moscow May 26, 1972.

Ratification advised by U.S. Senate August 3, 1972.

Ratified by U.S. President September 30, 1972.

Proclaimed by U.S. President October 3, 1972.

Instruments of ratification exchanged October 3, 1972.

Entered into force October 3, 1972.

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties.

Proceeding from the premise that nuclear war would have devastating consequences for all mankind.

Considering that effective measures to limit anti-ballistic missile systems would be a substantial factor in curbing the race in strategic offensive arms and would lead to a decrease in the risk of outbreak of war involving nuclear weapons.

Proceeding from the premise that the limitation of anti-ballistic missile systems, as well as certain agreed measures with respect to the limitation of strategic offensive arms, would contribute to the creation of more favorable conditions for further negotiations on limiting strategic arms.

Mindful of their obligations under Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons.

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament.

Desiring to contribute to the relaxation of international tension and the strengthening of trust between States.

Have agreed as follows:

ARTICLE I

1. Each party undertakes to limit anti-ballistic missile (ABM) systems and to adopt other measures in accordance with the provisions of this Treaty.

2. Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and not to provide a base for such a defense, and not to deploy ABM systems for defense of an individual region except as provided for in article III of this Treaty.

ARTICLE II

1. For the purpose of this Treaty an ABM system is a system to counter strategic ballistic missiles of their elements in flight trajectory, currently consisting of:

(a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode;

(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and

(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.

2. The ABM system components listed in paragraph 1 of this Article include those which are:

(a) operational;

(b) under construction;

(c) undergoing testing;

(d) undergoing overhaul, repair or conversion; or

(e) mothballed.

ARTICLE III

Each Party undertakes not to deploy ABM systems or their components except that:

(a) within one ABM system deployment area having a radius of one hundred and fifty kilometers and centered on the Party's national capital, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, and (2) ABM radars within no more than six ABM radar complexes, the area of each complex being circular and having a diameter of no more than three kilometers; and

(b) within one ABM system deployment area having a radius of one hundred and fifty kilometers and containing ICBM silo launchers, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites (2) two large phased-array ABM radars comparable in potential to corresponding ABM radars operational or under construction on the date of signature of the Treaty in an ABM system deployment area containing ICBM silo launchers, and (3) no more than eighteen ABM radars each having a potential less than the potential of the smaller of the above-mentioned two large phased-array ABM radars.

ARTICLE IV

The limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges. Each Party may have no more than a total of fifteen ABM launchers at test ranges.

ARTICLE V

1. Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.

2. Each Party undertakes not to develop, test, or deploy ABM launchers for launching more than one ABM interceptor missile at a time from each launcher, not to modify deployed launchers to provide them with such a capability, not to develop, test, or deploy automatic or semi-automatic or other similar systems for rapid reload of ABM launchers.

ARTICLE VI

To enhance assurance of the effectiveness of the limitations on ABM systems^s and their components provided by the Treaty each Party undertakes.

(a) not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode, and

(b) not to deploy in the future radars for early warning of strategic ballistic missile attack except at locations along the periphery of its national territory and oriented outward.

ARTICLE VII

Subject to the provisions of this Treaty, modernization and replacement of ABM systems or their components may be carried out.

ARTICLE VIII

ABM systems or their components in excess of the numbers or outside the areas specified in this Treaty, as well as ABM systems or their components prohibited by this Treaty, shall be destroyed or dismantled under agreed procedures within the shortest possible agreed period of time.

ARTICLE IX

To assure the viability and effectiveness of this Treaty, each Party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this Treaty.

ARTICLE X

Each Party undertakes not to assume any international obligations which would conflict with this Treaty.

ARTICLE XI

The Parties undertake to continue active negotiations for limitations on strategic offensive arms.

ARTICLE XII

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. Each Party undertakes not to use deliberate concealment measures which impede certification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

ARTICLE XIII

1. To promote the objectives and implementation of the provisions of this Treaty, the Parties shall establish promptly a Standing Consultative Commission within the framework of which they will:

(a) consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous;

(b) provide on a voluntary basis such information as either Party considers necessary to assure confidence in compliance with the obligations assumed;

(c) consider questions involving unintended interference with national technical means of verification;

(d) consider possible changes in the strategic situation which have a bearing on the provisions of this Treaty;

(e) agree upon procedures and dates for destruction or dismantling of ABM systems or their components in cases provided for by the provisions of this Treaty;

(f) consider, as appropriate, possible proposals for further increasing the viability of this Treaty, including proposals for amendments in accordance with the provisions of this Treaty;

(g) consider, as appropriate, proposals for further measures aimed at limiting strategic arms.

2. The Parties through consultation shall establish, and may amend as appropriate, Regulations for the Standing Consultative Commission governing procedures, composition and other relevant matters.

ARTICLE XIV

1. Each Party may propose amendments to this Treaty. Agreed amendments shall enter into force in accordance with the procedures governing the entry into force of this Treaty.

2. Five years after entry into force of this Treaty, and at five-year intervals thereafter, the Parties shall together conduct a review of this Treaty.

ARTICLE XV

1. This Treaty shall be of unlimited duration.

2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

ARTICLE XVI

1. This Treaty shall be subject to ratification in accordance with the constitutional procedures of each Party. The Treaty shall enter into force on the day of the exchange of instruments of ratification.

2. This Treaty shall be registered pursuant to Article 102 of the Charter of the United Nations.

Done at Moscow on May 26, 1972, in two copies, each in the English and Russian languages, both texts being equally authentic.

For the United States of America; For the Union of Soviet Socialist Republics:

President of the
United States of America.

General Secretary of the
Central Committee of the CPSU.

AGREED STATEMENTS, COMMON UNDERSTANDINGS, AND UNILATERAL STATEMENTS REGARDING THE TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE LIMITATION OF ANTI-BALLISTIC MISSILES

1. AGREED STATEMENTS

The document set forth below was agreed upon and initialed by the Heads of the Delegations on May 26, 1972 (letter designations added):

AGREED STATEMENTS REGARDING THE TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS

[A]

The Parties understand that, in addition to the ABM radars which may be deployed in accordance with subparagraph (a) of Article III of the Treaty, those

non-phased-array ABM radars operational on the date of signature of the Treaty within the ABM system deployment area for defense of the national capital may be retained.

[B]

The Parties understand that the potential (the product of mean emitted power in watts and antenna area in square meters) of the smaller of the two large phased-array ABM radars referred to in subparagraph (b) of Article III of the Treaty is considered for purposes of the Treaty to be three million.

[C]

The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers.

[D]

In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the Treaty.

[E]

The Parties understand that Article V of the Treaty includes obligations not to develop, test or deploy ABM interceptor missiles for the delivery by each ABM interceptor missile of more than one independently guided warhead.

[F]

The Parties agree not to deploy phased-array radars having a potential (the product of mean emitted power in watts and antenna area in square meters) exceeding three million, except as provided for in Article III, IV and VI of the Treaty, or except for the purposes of tracking objects in outer space or for use as national technical means of verification.

[G]

The Parties understand that Article IX of the Treaty includes the obligation of the US and the USSR not to provide to other States technical descriptions or blue prints specially worked out for the construction of ABM systems and their components limited by the Treaty.

2. COMMON UNDERSTANDINGS

Common understanding of the Parties on the following matters was reached during the negotiations:

A. LOCATION OF ICBM DEFENSES

The U.S. Delegation made the following statement on May 26, 1972:

Article III of the ABM Treaty provides for each side one ABM system deployment area centered on its national capital and one ABM system deployment area containing ICBM silo launchers. The two sides have registered agreement on the following statement: "The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers." In this connection, the U.S. side notes that its ABM system deployment area for defense of ICBM silo launchers, located west of the Mississippi River, will be centered in the Grand Forks ICBM silo launcher deployment area. (See Agreed Statement [C].)

B. ABM TEST RANGES

The U.S. Delegation made the following statement on April 26, 1972:

Article IV of the ABM Treaty provides that "the limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges." We believe it would be useful to assure that there is no misunderstanding as to current ABM test ranges. It is our understanding that ABM test ranges encompass the area within which ABM components are located for test purposes. The current U.S. ABM test ranges are at White Sands, New Mexico, and at Kwajalein Atoll, and the current Soviet ABM test range is near Sary Shagan in Kazakhstan. We consider that non-phased array radars of types used for range safety or instrumentation purposes may be located outside of ABM test ranges. We interpret the reference in Article IV to "additionally agreed test ranges" to mean that ABM components will not be located at any other test ranges without prior agreement between our Governments that there will be such additional ABM test ranges.

On May 5, 1972, the Soviet Delegation stated that there was a common understanding on what ABM test ranges were, that the use of the types of non-ABM radars for range safety or instrumentation was not limited under the Treaty, that the reference in Article IV to "additionally agreed" test ranges was sufficiently clear, and that national means permitted identifying current test ranges.

C. MOBILE ABM SYSTEMS

On January 29, 1972, the U.S. Delegation made the following statement:

Article V(1) of the Joint Draft Text of the ABM Treaty includes an undertaking not to develop, test, or deploy mobile land-based ABM systems and their components. On May 5, 1971, the U.S. side indicated that, in its view, a prohibition on deployment of mobile ABM systems and components would rule out the deployment of ABM launchers and radars which were not permanent fixed types. At that time, we asked for the Soviet view of this interpretation. Does the Soviet side agree with the U.S. side's interpretation put forward on May 5, 1971?

On April 13, 1972, the Soviet Delegation said there is a general common understanding on this matter.

D. STANDING CONSULTATIVE COMMISSION

Ambassador Smith made the following statement on May 22, 1972:

The United States proposes that the sides agree that, with regard to initial implementation of the ABM Treaty's Article XIII on the Standing Consultative Commission (SCC) and of the consultation Articles to the Interim Agreement on offensive arms and the Accidents Agreement,¹ agreement establishing the SCC will be worked out early in the follow-on SALT negotiations; until that is completed, the following arrangements will prevail: when SALT is in session, any consultation desired by either side under these Articles can be carried out by the two SALT Delegations; when SALT is not in session, *ad hoc* arrangements for any desired consultations under these Articles may be made through diplomatic channels.

Minister Semenov replied that, on an *ad referendum* basis, he could agree that the U.S. statement corresponded to the Soviet understanding.

E. STANDSTILL

On May 6, 1972, Minister Semenov made the following statement:

In an effort to accommodate the wishes of the U.S. side, the Soviet Delegation is prepared to proceed on the basis that the two sides will in fact observe the obligations of both the Interim Agreement and the ABM Treaty beginning from the date of signature of these two documents.

In reply, the U.S. Delegation made the following statement on May 20, 1972:

The U.S. agrees in principle with the Soviet statement made on May 6 concerning observance of obligations beginning from date of signature but we would like to make clear our understanding that this means that, pending ratification and

¹ See Article 7 of Agreement to Reduce the Risk of Outbreak of Nuclear War Between the United States of America and the Union of Soviet Socialist Republics, signed Sept. 30, 1971.

acceptance, neither side would take any action prohibited by the agreements after they had entered into force. This understanding would continue to apply in the absence of notification by either signatory of its intention not to proceed with ratification or approval.

The Soviet Delegation indicated agreement with the U.S. statement.

3. UNILATERAL STATEMENTS

The following noteworthy unilateral statements were made during the negotiations by the United States Delegation:

A. WITHDRAWAL FROM THE ABM TREATY

On May 9, 1972, Ambassador Smith made the following statement:

The U.S. Delegation has stressed the importance the U.S. Government attaches to achieving agreement on more complete limitations on strategic offensive arms, following agreement on an ABM Treaty and on an Interim Agreement on certain measures with respect to the limitation of strategic offensive arms. The U.S. Delegation believes that an objective of the follow-on negotiations should be to constrain and reduce on a long-term basis threats to the survivability of our respective strategic retaliatory forces. The USSR Delegation has also indicated that the objectives of SALT would remain unfulfilled without the achievement of an agreement providing for more complete limitations on strategic offensive arms. Both sides recognize that the initial agreements would be steps toward the achievement of more complete limitations on strategic arms. If an agreement providing for more complete strategic offensive arms limitations were not achieved within five years, U.S. supreme interests could be jeopardized. Should that occur, it would constitute a basis for withdrawal from the ABM Treaty. The U.S. does not wish to see such a situation occur, nor do we believe that the USSR does. It is because we wish to prevent such a situation that we emphasize the importance the U.S. Government attaches to achievement of more complete limitations on strategic offensive arms. The U.S. Executive will inform the Congress, in connection with Congressional consideration of the ABM Treaty and the Interim Agreement, of this statement of the U.S. position.

B. TESTED IN ABM MODE

On April 7, 1972, the U.S. Delegation made the following statement:

Article II of the Joint Text Draft uses the term "tested in an ABM mode," in defining ABM components, and Article VI includes certain obligations concerning such testing. We believe that the sides should have a common understanding of this phrase. First, we would note that the testing provisions of the ABM Treaty are intended to apply to testing which occurs after the date of signature of the Treaty, and not to any testing which may have occurred in the past. Next, we would amplify the remarks we have made on this subject during the previous Helsinki phase by setting forth the objectives which govern the U.S. view on the subject, namely, while prohibiting testing of non-ABM purposes: not to prevent testing of ABM components, and not to prevent testing of non-ABM components for non-ABM purposes. To clarify our interpretation of "tested in an ABM mode," we note that we would consider a launcher, missile or radar to be "tested in an ABM mode" if, for example, any of the following events occur: (1) a launcher is used to launch an ABM interceptor missile, (2) an interceptor missile is flight tested against a target vehicle which has a flight trajectory with characteristics of a strategic ballistic missile flight trajectory, or is flight tested in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range, or is flight tested to an altitude inconsistent with interception of targets against which air defenses are deployed, (3) a radar makes measurements on a cooperative target vehicle of the kind referred to in item (2) above during the reentry portion of its trajectory or makes measurements in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range. Radars used for purposes such as range safety or instrumentation would be exempt from application of these criteria.

C. NO-TRANSFER ARTICLE OF ABM TREATY

On April 18, 1972, the U.S. Delegation made the following statement:

In regard to this Article [IX], I have a brief and I believe self-explanatory statement to make. The U.S. side wishes to make clear that the provisions of

this Article do not set a precedent for whatever provision may be considered for a Treaty on Limiting Strategic Offensive Arms. The question of transfer of strategic offensive arms is a far more complex issue, which may require a different solution.

D. NO INCREASE IN DEFENSE OF EARLY WARNING RADARS

On July 28, 1970, the U.S. Delegation made the following statement:

Since Hen House radars [Soviet ballistic missile early warning radars] can detect and track ballistic missile warheads at great distances, they have a significant ABM potential. Accordingly, the U.S. would regard any increase in the defenses of such radars by surface-to-air missiles as inconsistent with an agreement.

SPACE LASER WEAPONS

Senator WARNER. Dr. Fossum, as Director of DARPA, you have responsibility for the space high-energy laser program. Could you give me your own personal views as to how we should proceed in this area?

Dr. Fossum. Mr. Warner, it is my view as Director of DARPA, that we have [deleted]. In addition, we are proceeding well in technology areas of [deleted]. It is further my view, however, that [deleted]. [Deleted] based on this technology. Consequently, I would recommend [deleted].

I believe we should proceed as follows: first, [deleted]. Such a program would incorporate [deleted]. This reduces the risk of time delays in working around possible [deleted], so to speak. Second, focus the program on [deleted]. This does not require a [deleted] however. Third, [deleted].

[Deleted.]

The decision to [deleted]. Fourth, assuming success, the decisions for proceeding with an [deleted] should be made [deleted]. Assuming success such a decision could be confidently made in [deleted].

Such is my opinion, Mr. Warner. Such a program has several advantages: first, the program is paced by [deleted] which is where this nation is strongest. Second, it allows the Secretary of Defense to [deleted]. Third, in my opinion, such a program is not substantially or reasonably different from a program which [deleted].

BMD HARDENED MATERIALS PROGRAM STATUS AND FUNDING

Question. What is the status of the BMD hardened materials program and what is the projected funding for fiscal year 1981 and 1982?

Answer. The BMD hardened materials program is a continuing effort to advance the state-of-art in design of BMD components to operate effectively in a severe tactical environment. Among the studies being conducted are material designs and candidates for radars, optical sensors, and advanced interceptors. It is an objective of the program to identify and develop hardened materials specifications, cost-effective designs, and manufacturing processes for BMD components. Following are some key dates and events from this program:

March 1980: Established hardness and damage thresholds for optical sensor components exposed to X-rays.

May 1980: Initiated correlation study between solar furnace thermal tests and thermal testing by high energy lasers.

July 1980: Tested thermal and electrical properties of candidate radar and interceptor antenna materials.

September 1982: Complete fabrication of full-scale interceptor forebody structure.

The materials program is funded through the Army Materials and Mechanics Research Center. The planned funding is \$4.5M per year for fiscal year 1981 and 1982.

BMD HARDENED MATERIALS PROGRAM ACCOMPLISHMENTS

Question. What have been the accomplishments of the BMD hardened materials program?

Answer. The hardened materials program has made significant contributions to materials development for BMD applications in the areas of interceptor heat-shields and structures, ground and interceptor borne radar antennas, and electronic devices and mirrors for optical sensors. Specific accomplishments include the following:

Interceptor.—Experimental tests have been conducted on candidate heatshields to evaluate multiple particle impact effects (e.g., dust, rain) during endoatmospheric flight; erosion resistant superalloy missile bodies have been developed that can survive flight through severe environments; an efficient encapsulated graphite/aluminum wire has been developed for advanced interceptor structures; and an ablation erosion analytical model has been developed for evaluating heatshield materials.

Antennas.—Basic experiments have been conducted which demonstrate the interaction phenomena between the heatshield and antenna window during interceptor flight. An understanding of these phenomena is required to successfully develop antenna windows for endoatmospheric homing interceptors. Materials experiments in a solar furnace have identified promising antenna materials for possible application to advanced interceptors.

Optics.—The materials program has contributed to hardened optical materials development for the following components: x-ray hardened mirrors; intrinsic detectors; nuclear-hardened detectors; and x-ray hardened optical sensor baffles.

LASL STUDY

Question. A recent study produced by Dr. Donald Kerr and Dr. Robert Kupperman, in conjunction with the Los Alamos National Scientific Laboratory, presents options for deploying BMD in defense of ICBMs. Could you provide your comments on this report?

Answer. The Los Alamos Scientific Laboratory (LASL) report is very supportive of the BMD role in achieving the objectives of strategic arms control and stability. The BMD Organization (BMDO) shares the general optimism expressed in the LASL report for both the ability to develop the layered defense technology and the ultimate BMD system performance. However, the technology for the exoatmospheric Overlay portion of the layered defense is still relatively immature and many critical technical issues remain to be addressed.

The BMD program has pursued a major technology development thrust in long wavelength infrared (LWIR) optics—the foundation of the Overlay system—for more than a decade. Progress to date has been extremely encouraging—indeed impressive. The BMDO has acquired substantial laboratory and simulation data on important aspects of the Overlay technology, but only limited flight test data. The Designating Optical Tracker (DOT) flights have been flown—all of which were successful—to collect LWIR signature data to demonstrate detection and discrimination of reentry vehicles (RVs) and associated objects. Additional flights are required—and planned—to acquire the essential data to increase confidence in the ability to handle larger and more complex threats, to hand over data between in-flight LWIR sensors, and to effect nonnuclear kill of an in-flight RV. Homing and kill flight tests have not been conducted to date, but [deleted]. There also are important system issues, such as [deleted]. The BMDO is optimistic that all of the issues can be resolved and that the necessary flight test programs will provide confidence in the Overlay system. However, budget constraints severely limit the rate of technology development and the conduct of the essential flight tests. The technology progress to date and the potential of the Overlay system provide a sound basis for increased investment in the Overlay program.

The exoatmospheric Overlay cost estimates contained in the LASL report probably are too low. Major contributions to the low estimate in the LASL report are inflation and the limited depth to which the costs were developed. The BMDO currently estimates the cost of an Overlay system to be approximately [deleted]. This could provide a stand-alone overlay defense of fixed-silo based ICBMs against a [deleted] with an FOC in the [deleted].

The BMDO agrees with the LASL view that BMD improves strategic stability, especially crisis stability, and that BMD can contribute to the broad objectives of arms control. Further, BMD can contribute to a constraining of the strategic offense force levels and is probably an essential element of any significant reductions in strategic arms.

The BMDO also generally agrees with the LASL assessment on directed energy weapon (DEW) technology. High energy laser and particle beam technology offer enormous potential; however, the technology is in an extremely embryonic state. Considerable additional investment will be necessary before the technology matures sufficiently to support the development of space-based BMD systems. It is not possible at this time to confidently predict when DEWs will become a reality. The prudent course of action appears to be continued technology invest-

ment with the objective of orderly development of DEW systems, beginning with the least stressing threats, such as anti-aircraft, anti-sensor, and anti-satellite systems, and then progressing to BMD systems since the BMD system requirements are the most stressing. The BMDO is confident that conventional BMD technology—such as that embodied in the Low Altitude Defense (LoAD) and exoatmospheric systems discussed in the LASL Report—is the correct focus for addressing the BMD needs in [deleted].

O&M CONTRACTS AT KMR

Question. Why has the Army chosen not to compete the contracts for O&M for KMR?

Answer. The Army strongly endorses a competitive procurement policy and has previously competed the Kwajalein Missile Range (KMR) O&M contracts. The existing technical support contract was completed in 1975; however, following an intensive review, the contract is being continued on a sole source basis due to imminent support of BMD programs having the highest DOD priority. During the contract performance period two Designating Optical Tracker (DOT) and [deleted] tests will be conducted at the KMR. The continued success of DOT and the future success of HOE flight test programs are totally dependent upon a precise interface with KMR instrumentation, e.g., radars, computers, telemetry, as well as critical sensor and software programs developed by the incumbent contractor; this instrumentation and software form the technical base for tracking, monitoring, and evaluating DOT and HOE experimental proof-of-principle test objectives. The preciseness of this interface and the sustained operational reliability of the KMR instrumentation depend upon the accumulated knowledge and experience of the incumbent contractor. The incumbent has accumulated this expertise during the past two years through an increasing role in BMD project test planning for both the DOT and HOE programs and during the first three successful DOT flights. In addition, the ability to immediately identify and correct any malfunction must be maintained at an inordinately high reaction level which can be provided only by the knowledge and experience as demonstrated by the incumbent contractor. The technical and economic risks that would arise by changing contractors at this time are unacceptable.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

DELAY IN MX DEPLOYMENT

Senator THURMOND. Dr. Wade, while I recognize the need for the new Administration to review strategic policies I am concerned about delay in MX deployment if it is decided that this is the way to go. When is the final decision due and what delay will result from that schedule?

Dr. WADE. We expect to make the final decision in July with no appreciable impact on the schedule in the one case in which the decision is to proceed with the current program. Any other decision would have to be carefully evaluated before we would know its impact on the schedule.

BALLISTIC MISSILE DEFENSE

Senator THURMOND. Dr. Wade, turning to strategic defense in what way does the ABM Treaty prohibit full development of the BMD concepts under consideration?

Dr. WADE. The ABM Treaty prohibits the development, testing or deployment of mobile land-based BMD systems and components and BMD interceptors capable of launching multiple independently guided war-heads. These prohibitions do not impose any significant limitations on our planned efforts to resolve the key technical issues associated with the Low Altitude Defense (LoAD) and Overlay Defense concepts. However, if we wish to exercise the option to deploy a system based on either concept it would be necessary to modify or terminate the ABM Treaty before initiating engineering development of a mobile LoAD system or an Overlay system with multiple kill vehicles.

Senator THURMOND. Dr. Wade, is the current ABM Treaty with the Soviets in any way driving our development of a successful ballistic missile defense system?

Dr. WADE. The ABM Treaty is not limiting our development or a successful ballistic missile defense at this time. It does limit our deployment of any effective BMD system. The Site Defense System has been partially developed, and could be fully developed, but not deployed in useful quantities under the ABM Treaty. In the absence of the ABM Treaty we would conduct our development programs somewhat differently, and hopefully with increased resources.

Senator THURMOND. On what basis do you state that DOD now sees BMD as a cost effective option against substantial increases in the U.S.S.R. ICBM threat?

Dr. WADE. The combination of Low Altitude Defense and multiple aimpoint basing of ICBMs results in a very high leverage for BMD since only the aimpoint containing the ICBM missile need be defended. Thus, a single BMD intercept in defense of the ICBM can offset many reentry vehicles.

Senator THURMOND. How much additional development money is likely if we are to provide confidence that the projected BMD capabilities are reasonable in the timeframe of interest?

Dr. WADE. On the accelerated schedule that will be possible with the \$39 million and \$92 million that is requested in the fiscal year 1981 and fiscal year 1982 supplemental budget requests, respectively, the Low Altitude Defense preprototype demonstration can be completed by [deleted] at a total cost of \$1.3 billion. Of this amount about \$1 billion will be required in fiscal year 1983 through [deleted.] Most of this, \$918 million, was included in the Five Year Defense Plan; however, an increase will be required in fiscal year 1983 and fiscal year 1984 to maintain the acceleration but an overall reduction in the cost of the BMD program will result from the acceleration and earlier completion. To conduct an Overlay defense development program would require an increase of about \$90 million per year for the next [deleted]. We are reviewing the advisability of conducting such a program.

Senator THURMOND. When is the earliest operational capability we might expect from the BMD systems if development and deployment continue at the presently scheduled pace?

Dr. WADE. Without the acceleration that will be possible with additional fiscal year 1981 and fiscal year 1982 funds that are requested, a Low Altitude Defense (LoAD) could reach an initial operational capability (IOC) in [deleted] with a full 200 units (FOC) deployed [deleted]. With the additional funds and the required out-year funding both the IOC and the FOC could be accelerated by 24 months. There is a higher cost and schedule risk option to enter engineering development in [deleted] and reach IOC in [deleted]. The current Overlay Defense program [deleted]. If technology development proceeds as planned, through [deleted] and then engineering development is initiated, the earliest possible IOC would be in the [deleted]. If the program is accelerated, and all goes well, an IOC in the [deleted] may be possible.

These figures are based on last years assessments, and focus on the LoADs and overlay concepts. With the new team on board, I am looking forward to reviewing these figures, with a judgment that an IOC using proven sprint technology in the [deleted] is feasible. I will report personally back to you when this new look is completed.

SPACE LASER WEAPONS

Senator THURMOND. Dr. Wade, turning to space laser weapons, have we allowed treaty negotiations to delay development of these systems in the past four years?

Dr. WADE. No, we have not.

Senator THURMOND. To your best knowledge, how do we stand vis-a-vis the Soviets in this high technology area (space laser weapons)?

Dr. WADE. Intelligence estimates indicate that the total Soviet high energy laser development program (all applications, tactical and strategic) is perhaps three to five times the size of the U.S. program. [Deleted.]

Senator THURMOND. The Soviets have stressed the antisatellite mission, which you say is the most attainable goal in the near term. Do we plan to do the same?

Dr. WADE. The Soviets do have a conventional, co-orbital antisatellite weapon. [Deleted.] Our present plans for space-based laser weapons, as contained in the fiscal year 1982 budget request, are for an approximately \$100 million effort in the Defense Advanced Research Projects Agency to develop component technology applicable to space-based laser systems. No integrated system demonstration or further step is contained in present plans. [Deleted.] No additional funds have been requested in the Reagan budget request amendment. We expect the report to the Senate and House Armed Services Committees to be ready for

transmittal to Congress in about the middle of May. If the Secretary of Defense should decide that a change in our plans is appropriate, you will be advised when the report is transmitted.

QUESTIONS SUBMITTED BY SENATOR WILLIAM WALLOP

SPACE LASER WEAPONS

Senator WALLOP. The testimony says that "the potential contributions of space-based laser weapons . . . must be viewed in the light of existing U.S. policies governing the employment and deployment of strategic offensive and defensive forces." What is your understanding of "existing U.S. policies" and in some detail how do they affect the way you regard the potential of space lasers?

Dr. FOSSUM. My response to this question is consistent with the interpretation contained within the Space Laser Weapons Study report which has not received the final approval of the Secretary of Defense. The current state of development of space-based laser technology precludes a precise assessment of these weapons with respect to existing strategic policies and makes it difficult to predict the substances of future policy issues in this area. The development of these capabilities augments and contributes to our general national policy objective of deterrence. Such capabilities would support our objective of being able to respond at any level of aggression that an opponent elects to initiate, and to deny him victory. Specifically, the development of space-based laser capabilities has the potential of contributing to our goals of assuring the survivability of strategic offensive retaliatory forces, defending continental United States based assets against a precursor and/or follow-on bomber attack, protecting key U.S. satellites, and providing the options of selectively degrading hostile space-based assets. Furthermore, pursuit of research and development in this area would contribute to our arms control policy objectives by increasing the incentives for the USSR to comply with existing agreements and to accept in the future such agreements as the U.S. may choose to pursue.

The ABM Treaty constrains deployment, and to a lesser extent, development of space-based laser weapons for ABM purposes. High energy laser research programs are not constrained by existing arms control agreements. The ABM Treaty does ban the development, testing and deployment of all ABM systems and components that are sea-based, air-based, space-based or mobile land-based. The Treaty permits the development and testing of fixed, land-based ABM systems and components based on other physical principles (such as lasers and particle beams), and including components capable of substituting for ABM interceptor missiles, ABM launchers or ABM radars. However, the Treaty prohibits the deployment of such land-based systems and components unless the Parties consult and amend the Treaty.

Only the actual use of space-based laser weapon systems to interfere with Soviet satellites used to verify compliance with strategic arms control agreements—as opposed to development, testing, or deployment of systems that could be used in such roles—is prohibited under the provisions of the ABM Treaty (Article XII), the SALT I Interim Agreement (Article V), and the SALT II agreement (Article XV).

The U.S. is a signatory to the Outer Space Treaty. In Article III, the signatories agree to the use of outer space for activities which are "in the interest of maintaining international peace and security and promoting international cooperation and understanding." In Article IV, the Parties undertake not to place in space "any objects carrying nuclear weapons, or any other kinds of weapons of mass destruction." Article IX requires international consultations prior to any planned activity or experiment, if the sponsor of such activity or experiment has reason to believe it would cause potentially harmful interference with the peaceful space activities of others. Nevertheless, despite these limitations on the use of space, the Outer Space Treaty does not prohibit the development, testing, or deployment of laser weapons in space.

It is evident that space-based lasers could have a profound impact on our and Soviet perceptions of national security. The U.S. cannot afford unilateral restraint regarding the development of such systems. On the contrary, particularly in view of the fact that the Soviet Union, in sharp contrast to the US, has an operational anti-satellite system, a vast strategic air defense, and a deployed

ABM system, it is evident that U.S. research and development in space-based lasers can make a vital contribution to our policy requirements of restoring the strategic balance.

LASER POWER FROM ALPHA LASER

Senator WALLOP. What level of laser power can we expect to achieve from the Alpha cylindrical laser if the laser is built with [deleted] recently developed at TRW and Rocketdyne?

Dr. FOSSUM. The competitive Alpha designs of TRW [deleted] and Rocketdyne [deleted] both incorporate [deleted] technology. Both are currently being designed to be ground tested [deleted]. Increasing the power of the ground demonstrator [deleted] would require [deleted] and an increase in the test facility's vacuum pumping capacity. The facility is currently scheduled to accommodate [deleted].

The [deleted] technology is believed applicable to power levels [deleted]. Weight and volume constraints for a space-based laser, however, [deleted]. Consequently, two distinct resonators are currently being designed by each contractor. Design analyses have shown that the [deleted].

Senator WALLOP. How quickly do those in industry directly responsible for laser device development believe they can build a laser device capable of [deleted] absent restrictions of funding and of procurement regulations?

Dr. FOSSUM. Absent restrictions of funding and of procurement regulations, the industrial contractors responsible for laser device development believe that from the beginning of [deleted]. Of this time period, the laser device subsystem fabrication is estimated to require [deleted]. In my opinion, the time required [deleted] prior to initiation of dedicated design efforts for such a program would require [deleted]. These comments of course apply to the laser subsystem, not to the integrated weapon system.

Senator WALLOP. What level of accuracy in pointing and tracking have been achieved in industrial laboratories? How quickly do those in industry directly responsible for achieving those accuracies believe they could build an operational pointer-tracker?

Dr. FOSSUM. The information I will give you is related to the Talon Gold Source Selection and is therefore competition sensitive. Pointing and tracking accuracies [deleted]. These results were achieved [deleted]. This performance level represents [deleted]. This [deleted] was made possible through the use of new optical tracker, inertial sensor and control system techniques developed specifically for high energy laser applications in space. Performance testing with simulated [deleted].

The [deleted] has been designed to [deleted]. These aspects of the system performance [deleted].

Detailed measurements made on the [deleted].

The contractors who have been responsible for these [deleted] have estimated that an operational pointing and tracking system could be developed, given sufficient funding, [deleted]. However, the DOD believes, based on its experience, that the time scale may be optimistic since it will depend upon resolution of critical issues involving [deleted].

Senator WALLOP. Is there any technological obstacle at all to building an [deleted] mirror capable of [deleted].

Dr. FOSSUM. There are numerous [deleted].

Today's state-of-the-art is the [deleted]. We have examined this technology sufficient to know what the key technical issues are [deleted].

The manufacture of an [deleted] mirror requires the optical fabrication of [deleted]. The answer here is twofold: [deleted].

[Deleted.] The latter are under development throughout the industry and show great promise [deleted]. The need to [deleted].

The question of survival of the mirror when subjected to laser radiation can be answered more directly. Because the [deleted].

Senator WALLOP. Would you describe the complexity of integrating lasers, pointer-trackers and large mirrors into a system of comparing it to, the complexity of the following programs: (a) [deleted] (b) the space telescope; (c) the Apollo program?

Dr. FOSSUM. We are not in a position to answer part (a) of your question but suggest instead that you ask the cognizant authorities for that system to provide such an analysis.

There are four salient features of an integrated space laser weapon platform that [deleted]. These key features [deleted] in the integration of subsystems of a laser weapon than for integration of Space Telescope components.

In comparing the complexity of the integrated Apollo platform ready for launch with an integrated high energy laser weapon prototype [deleted] there are numerous qualitative differences that must be assessed subjectively. For example, the Apollo system was designed to send men to the moon and return them with a 99.9 percent probability of success. This requirement [deleted] the presence of man in the loop reduced the complexity of some tasks such as landing on the moon. The maturity of the technology required for Apollo in 1961 is [deleted]. Thus our subjective assessment is that the laser weapon integration complexity is [deleted]. If one considers the laser weapon within the overall system context including [deleted].

Senator WALLOP. Would you then estimate how long it would take to integrate a prototype laser weapon? Compare your estimate with the record of the above-mentioned programs and explain why your estimate is as it is.

Dr. FOSSUM. I believe that a [deleted]. This program is [deleted]. In such a program, [deleted].

The NASA Space Telescope is currently scheduled for launch in early fiscal year 1984. This represents a total program duration of seven years, [deleted].

The Apollo program required approximately eight years from program start to launch, [deleted]. This is consistent with my view, as stated in the answer to the previous question, [deleted].

Senator WALLOP. How much laser energy—joules/cm² at 2.7 microns and at 10.2 microns—can the following U.S. missiles take during boost phase [deleted].

Dr. FOSSUM. We do [deleted].

The fluence estimates [deleted]. Such data have been incorporated into simplified models describing the [deleted]. The Titan missile, like most Soviet boosters, uses liquid rather than solid propellant. For such systems, the vulnerable points are the [deleted].

Both DARPA and BMDATC are currently supporting a limited number of efforts to provide [deleted] on the fluence requirements to damage materials such as barrier materials. Test will also be conducted on [deleted]. This is being supported by detailed laser interaction and structural vulnerability analyses.

The results from these programs will increase the confidence in fluence estimates for lethal damage to [deleted] ballistic missiles. [Deleted].

Senator WALLOP. If one were to harden the boosters of [deleted].

Dr. FOSSUM. Using conventional materials technology, [deleted].

In addition to the well understood ablative properties required for hardening, the materials must provide insulation as well. Although material designers have proposed several approaches which they believe would give the requisite combined characteristics, the actual materials for this purpose have not been fabricated or tested. Likewise, there has been interaction between the materials and missile designers and it appears that the attachment and mechanical issues can be resolved. However, until materials are specifically designed for this purpose and tested, the precise impact on aerodynamic and structural characteristics cannot be confidently stated.

Depending on the results of materials tests and the degree of hardening retrofit, some booster requalification tests would be necessary in my judgement.

Senator WALLOP. What would a [deleted].

Dr. FOSSUM. Using the same approximations employed in previous analyses, [deleted].

If, however, [deleted].

Senator WALLOP. If the President of the United States were to order you to [deleted] and he was willing to dedicate the necessary resources, take the necessary risks, and to set aside the necessary regulations, what would the program look like which would give you the best chance of meeting that goal?

Dr. FOSSUM. First of all, it would clearly be a program [deleted] involving extraordinary risk and approaches to weapon procurement that have never been tried before.

We would have to simultaneously initiate, this year, procurement programs for a [deleted].

To have a chance at meeting that goal the program would drive toward [deleted].

The [deleted] would require intensive efforts to resolve uncertainties in designing and engineering the system and subsystem components and in providing the necessary production facilities. [Deleted].

The above describes what would have to be accomplished to meet this very aggressive goal. The program would clearly be delayed if unidentified technical or integration obstacles were encountered. The brief assessment of this program indicates that the probability of encountering such obstacles is very high. Such delays would be extremely costly [deleted]. Since the program is described in the context of "best chance of meeting that goal", its basis is substantially more uncertain than that of the other program options described in our testimony. I would personally consider such a program unwise.

Senator WARNER. I believe we have put together a very interesting record this morning. I appreciate your indulgence in this matter. Thank you very much.

[Whereupon, at 12 p.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

FRIDAY, MARCH 6, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

STRATEGIC COMMAND, CONTROL, AND COMMUNICATIONS

The subcommittee met in open session at 8:39 a.m. in room 224, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Present: Senators Warner and Nunn.

Staff present: William L. Ball III, chief clerk, Frank J. Gaffney, Ronald F. Lehman, and E. George Riedel, professional staff members; Brenda K. Hudson and Karen A. Love, staff assistants.

Also present: Frank Krebs, assistant to Senator Cannon; Greg Pallas, assistant to Senator Exon; and Peter Lennon, assistant to Senator Levin.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. This morning the subcommittee will resume a series of hearings on the strategic capabilities of the United States. The subject for this morning's session is command, control, and communications which is the very heart of this Nation's defensive capabilities and strategic forces.

We have witnessed during this past year three false alarms. This subcommittee as well as the full committee and in particular, Senators Hart and Goldwater have gone into the causes for those false alarms, and this morning we will look at the corrective measures proposed to be taken, because this can never happen again.

While we experienced the alarms, this committee has ascertained through evidence given primarily by you gentlemen that at no time was this country in any peril nor was there any real risk of a release of a nuclear weapon, but we bear in mind that the linkage between the President of the United States and you as military commanders is through a system of communication which has to be absolutely perfect, the best in the country.

Recognizing this, President Reagan has indicated to the Congress his desire to add at least a billion dollars additional funding to improve and upgrade the communication network that links him with his military commanders.

As witnesses this morning, we have Hon. Harry L. Van Trees, Acting Assistant Secretary of Defense for Communications, Command, Control, and Intelligence; General Ellis, Director, Joint Strategic Connectivity Staff and Commander in Chief, Strategic Air Command; Lt. Gen. James V. Hartinger, Commander in Chief, North American Air Defense Command; Lt. Gen. Hillman Dickinson, U.S. Army, Director of the C³ Systems; and Rear Adm. Paul D. Tomb, Vice Director, Joint Strategic Connectivity Staff.

I should like to ask each of you gentlemen if you have a brief opening statement at the conclusion of which we will go into executive session. At this time, I invite my colleague, Senator Nunn, to make an opening comment.

Senator NUNN. Mr. Chairman, I do not have much to add to your excellent opening statement. I would just reemphasize that of all the parts of our strategic deterrent I think that this area that we are focusing on this morning is not only most important but also at this particular part of history most vulnerable.

I think the work that General Ellis has done is very, very important. I do not think that we have had anyone that has concentrated on it more than they have out at SAC, and I have talked to both General Ellis and Admiral Tomb about the problem. I spent a great deal of time with General Ellis on it last year.

It is extremely important, and I am glad that the Reagan administration is beginning to really focus on it. I am delighted that this subcommittee is focused on it. We are not going to wave a magic wand and cure it over night, but I think that this focus will certainly help us. I look forward to participating in this hearing.

Senator WARNER. Thank you.

Mr. Secretary.

STATEMENT OF HON. HARRY L. VAN TREES, ACTING ASSISTANT SECRETARY OF DEFENSE FOR COMMUNICATIONS, COMMAND, CONTROL, AND INTELLIGENCE

Mr. VAN TREES. Thank you, Mr. Chairman.

We welcome this opportunity to appear before you this morning to discuss strategic C³. As you have pointed out, it is a vital part of our deterrence. What we would like to do this morning is have General Ellis and General Hartinger present the status of the system now, its connectivity, the threat to the system, some of its deficiencies, and how well it performs.

After we do that, I would like to lay out for you the programs that we have in the budget to achieve the necessary improvements and modernization to make our strategic C³ the reliable part of our deterrence that it must be.

At this time, I would like to introduce General Ellis who is appearing as Director of the Joint Strategic Connectivity Staff.

General Ellis.

STATEMENT OF GEN. RICHARD H. ELLIS, USAF, DIRECTOR, JOINT STRATEGIC CONNECTIVITY STAFF, JCS; AND COMMANDER IN CHIEF, STRATEGIC AIR COMMAND; AND DIRECTOR, STRATEGIC TARGET PLANNING, JCS

General ELLIS. Good morning, Mr. Chairman.

Senator WARNER. Good morning, General.

General ELLIS. And Senator Nunn.

Senator NUNN. Good morning.

General ELLIS. My colleagues and I from the Joint Strategic Connectivity Staff and the Strategic Air Command welcome the opportunity to appear before this subcommittee.

Our business is to insure that the Nation's strategic connectivity is as effective, survivable, and enduring as our weapons systems. Dependable connectivity from a decisionmaker to the weapons systems operator is an essential element of our deterrent posture, or as the chairman of the general advisory committee on arms control and disarmament recently said, effective, robust, sophisticated, and redundant C³I can make as large a contribution as any weapons program to the basic strength of our strategic posture in reassuring our friends and deterring our adversaries.

This subcommittee's hearings on this subject constitute an essential link in the establishment, procurement, and maintenance of a viable connectivity posture for the years ahead. When we go into closed session, Mr. Chairman, I would first like to talk about what constitutes strategic connectivity.

Senator WARNER. Thank you, General Ellis.

General Hartinger.

STATEMENT OF LT. GEN. JAMES V. HARTINGER, COMMANDER IN CHIEF, NORTH AMERICAN AIR DEFENSE

General HARTINGER. Mr. Chairman, Senator Nunn, as Commander in Chief of the North American Air Defense Command, I picture our command as the defensive platoon on our strategic deterrent team, and as such, we must be able to provide reliable missile warning and precise attack assessment so that our National Command Authority can have the capability to exercise flexible response options.

Today we need not only a retaliatory force but a flexible, responsive retaliatory force, and having that depends in part on NORAD's warning and assessment capabilities.

I want to thank you, sir, and the members of your committee for recognizing the importance of the command, control, and communication requirements to support the vital strategic mission areas, both offense and defense.

Senator WARNER. Thank you, very much.

Mr. Secretary and witnesses, we will now go into executive session. The subject matter before this committee is top secret. Therefore, we ask all persons in the room without the proper clearance to please depart.

[Whereupon, at 8:47 the subcommittee recessed to reconvene in executive session.]

EXECUTIVE SESSION

The subcommittee met in executive session, at 8:50 a.m. in room 224, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Present: Senators Warner, Goldwater, Quayle, and Nunn.

Staff present: Rhett B. Dawson, staff director and chief counsel; Francis J. Sullivan, minority staff director; Frank J. Gaffney, Ronald F. Lehman, E. George Riedel, and James C. Smith, professional staff members; Brenda K. Hudson and Mary A. Shields, staff assistants.

Also present: Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Greg Pallas, assistant to Senator Exon; Peter Lennon, assistant to Senator Levin; Willis Smith, assistant to Senator Jackson; Robert Riebling, assistant to Senator Thurmond.

Senator WARNER. We are now in executive session, and I am assured by counsel to the committee and the representative who is facilitating the appearances of the witnesses from the Department of Defense that the room is now secure such that we can continue our hearing.

Mr. Secretary, we welcome you back before this subcommittee, and ask that you make the initial statement.

STATEMENT OF HON. HARRY L. VAN TREES, ACTING ASSISTANT SECRETARY OF DEFENSE FOR COMMUNICATIONS, COMMAND, CONTROL, AND INTELLIGENCE—Continued

Mr. VAN TREES. Thank you, Mr. Chairman.

The way I would like to proceed this morning with your approval is that I will give a very short overview of strategic command, control, and communications (C³) to lay the groundwork for the rest of the presentation. Then I will ask General Ellis, and General Hartinger, and General Dickinson, and Admiral Tomb to go into some detail of the connectivity of our present system, some of the threats to it, and their assessment of how well the current system can respond.

After we have done this, I will give you a brief overview of the budget; first, the Carter budget and the resources contained in it, and then I will review some of the major programs that we are recommending which we think will cause significant improvement in the system and correct some of the deficiencies that you will have heard about earlier.

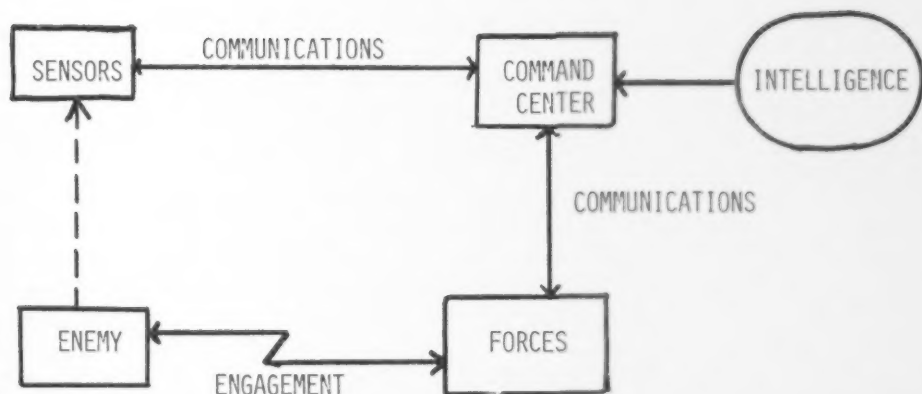
Then I will briefly summarize the Reagan budget amendment to show where we added money in to fill what we thought were the shortfalls in the previous budget. Then I will briefly speak about improvements to the NORAD facility improvements that we have since last June, and a few brief comments on what we thought was an excellent report by Senators Hart and Goldwater.

I will go through the first several charts very quickly because I think that both of you are very familiar with the system, but I think that a little groundwork would be useful.

DEFINITION

First, a definition: C³, command, control, and communications. It consists of systems, equipment, and, it is important to remember, the personnel and procedures that are necessary to manage and employ our forces and weapons.

ELEMENTS OF C³ SYSTEM



Often C³ is thought of as a very complicated thing, but I think that one should remember that in all military areas—strategic, theater, tactical—there are three basic elements in the C³ system. There are the sensors. These can be [deleted] satellites, radars on the ground.

Next, there are the command centers. These can be fixed—such as the one in the Pentagon—or mobile, as in the airborne command posts. Finally, there are communication links between the sensors and the command posts and between the command posts and the forces. These three elements, while they have different names and different realizations, are the heart of our C³ systems: sensors, communication, and command posts.

IMPORTANCE OF C³

"Increasing Soviet C³ capabilities must be countered by increasing our capabilities to achieve early warning. Timely action or reaction requires secure antijam, survivable communications at all levels of command." (Cinclant)

"Modernizing our deterrent force structure with such systems as the ALCM, the MX, and the Trident is not enough. C³ systems also must be modernized because a weapon system without effective communications is impotent." (CINCSAC)

"In my judgment, there is nothing more important in our entire strategic modernization efforts, ongoing today, than correcting the enduring C³ problem. [deleted] unless we are committed to solving C³ endurability." (CNO)

I put several quotes here on the importance of C³. I think that all of us in the room realize its importance, but I think that these particular words are useful because here are two of our most important commanders in chief, CINCSAC, CINCLANT, arguing that C³ plays in their mind an equally important role as the MX and the ALCM. This emphasis by our senior commanders that we think has resulted in much of the improvement in the posture of C³ and our ability to get more effective programs in the budget.

Finally, a comment by the Chief of Naval Operations that he does not feel [deleted] unless we, at the same time, improve, C³. Now, to remind you, our role is maintaining an effective deterrent.

This requires not only adequate nuclear forces but a C³ system which is reliable and survivable to direct those forces.

STRATEGIC C³

Effective deterrence requires: Adequate nuclear forces and a C³ system that enables NCA to direct these forces.

If deterrence fails: C³ must provide the information, command facilities, and communications necessary to fight a nuclear war.

While we often speak of a triad, the fourth part of it, strategic C³, is equally important. Then if deterrence fails, the C³ system has to provide the commanders the ability to manage their forces.

[Chart deleted.]

This cartoon shows the strategic C³ system, and it is perhaps useful as a basis to follow some of the discussion that the subsequent witnesses will go through. In the upper lefthand corner are the warning systems, the [deleted] satellites, and the ground-based radars; then there are communications from the sensors to the command centers. In the center are the key command centers, the one in the Pentagon, the alternate at Fort Ritchie, the airborne command posts and NORAD. Finally, the chart shows the communications going out to the forces.

[Chart deleted.]

To put the problem in context, the next chart shows a typical scenario. You will notice that there are three phases up at the top of the chart; a pre-attack period, and I have labeled a point there enemy launch, and then an initial attack period which is sometimes called the transattack period.

Looking in more detail at this initial attack phase, there are three time frames. First, there is a pre-NUDET period; this is from the time that the first missile is launched until the first detonation on the United States. Second, there is a period after SLBM detonations begin and before ICBM detonations commence. And third, there is a period in which there are ICBM detonations. The reason for breaking it down this way is that the C³ system has to do different things in these periods and is subject to different stresses in these periods.

Finally, in the period that I have labeled protracted war, [deleted] we have an immediate postattack phase, and then a phase in which we have recovery and reconstitution.

The reason for making this distinction is that we need systems that will survive through this transattack period, but then we also need to design systems that can be reconstituted after the initial attack is over.

On the bottom of the chart, I have shown the necessary objectives of strategic C³: Survival actions, the ability to provide a launch under attack option to the President, the ability to execute major attack options, the ability to manage a secure reserve force, and the ability for termination.

Throughout this scenario is the key element of force management. General Ellis will talk about this in the course of his presentation. It is the ability that he needs to maintain the connectivity to manage his forces.

THREATS TO C³ SYSTEM

Physical attack [deleted].

Antisatellite attacks (ASAT).

[Deleted.]

Electronic countermeasures (jamming).

Nuclear effects.

[Deleted.]

The final chart in this overview refers to something that we have seen over the last several years, that the threats to our C³ system—along with the threats to our strategic weapon systems—have grown. The first threat category is physical attack. [Deleted.] So, the physical threat to the strategic C³ system has grown significantly over the last several years.

In addition, the need for timeliness of strategic C³ has grown. [Deleted.]

We must also consider the possibility of antisatellite attacks. You have seen in the literature the fact that the Soviets have demonstrated the ability to attack satellites [deleted].

Sabotage is another form of physical attack. [Deleted.]

So, the first large category is physical attack. The second category is electronic countermeasures or jamming. [Deleted.] This, in essence, gives you noise in your reception instead of the message. [Deleted.] Then, there is a final category of jammers. [Deleted.]

So, jamming has been a real threat. We have, as quickly as we can, been improving our communications [deleted]. The thing that has slowed this down is that the technology was not available. It has become available, and we have sponsored a great deal of research to improve this technology.

The second way is designing the system to be more resistant to jamming. Once again, we are moving rapidly to incorporate this antijam capability in our communications.

Another threat arises from nuclear effects [deleted]. General Dickinson will discuss the phenomena in more detail. [Deleted.]

So, the point that I wanted to convey with this is that over the last several years the threat in all three areas has increased; physical attack [deleted] jammers, and the ability to exploit nuclear effects and disrupt our C³.

It is these threats that we have to modernize our system against. Now, with this as background, I would like to introduce General Ellis who will talk about strategic connectivity.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Van Trees follows:]

PREPARED STATEMENT BY DR. HARRY L. VAN TREES, ACTING ASSISTANT SECRETARY OF DEFENSE, COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

I. INTRODUCTION

Good morning gentlemen. I am Harry Van Trees, the Acting Assistant Secretary of Defense for Communications, Command and Control and Intelligence. I welcome the opportunity to discuss with you what I believe to be a critical component of our strategic military capability—namely, strategic command, control and communications, or C³. With me this morning is General Ellis and Rear Admiral Tomb who appear in their roles, respectively, as Director and Deputy Director of the Joint Strategic Connectivity Staff, and Lieutenant General Dickinson of the

Organization of the Joint Chiefs of Staff. Lieutenant General Hartinger, the Commander-in-Chief of NORAD is also here.

This format I would like to follow this morning is that after my brief overview of strategic C³, General Ellis, Admiral Tomb and General Dickinson will describe in some detail the connectivity of the current strategic system; and they will present some recommendations for near-term improvements. General Hartinger will describe sensors, computer facilities and the communications which support the U.S. warning and attack assessment system. I will then conclude with the program we have underway or planned to strengthen the strategic C³ system.

Strategic C³ consists of the systems, equipments, facilities, personnel, and procedures necessary to manage and employ our strategic forces and weapons. In peacetime it is an essential element of our deterrent posture, but if deterrence fails, it must be capable of providing the means to fight a nuclear war.

Effective deterrence requires: adequate nuclear forces and a C³ system that enables NCA to direct these forces.

If deterrence fails: C³ system must provide the information, command facilities, and communications necessary to fight a nuclear war.

The importance of strategic C³ is recognized, understood, and supported as critical by our military commanders:

"Modernizing our deterrent force structure with such systems as the ALCM, the MX, and the Trident is not enough, C³ systems also must be modernized because a weapon system without effective communications is impotent." (CINCSAC)

"In my judgement, there is nothing more important in our entire strategic modernization efforts, ongoing today than correcting the enduring C³ problem. [Deleted] unless we are committed to solving C³ durability." (CNO)

"Increasing Soviet C³ capabilities must be countered by increasing our capabilities to achieve early warning. Timely action or reaction requires secure anti-jam, survivable communications at all levels of command." (CINCLANT)

The major elements of the system include:

Sensors: Attack warning and assessment; status of forces; strike assessment.

Command centers: Force-employment planning; evaluation of situation and response alternatives; preparation of orders for employment.

Communications: Warning data from sensors; between NCA and senior military commanders; execution commands to the forces; reconstitution of forces; termination orders to forces.

In an unstressed environment, the strategic C³ system works well; however, in the event of hostile threats to the system, we need better means to ensure that we have the necessary means to manage the forces. These hostile threats are:

Physical attack: [Deleted]; anti-satellite (ASAT) attacks; [deleted]; electronic countermeasures (jamming); effects of nuclear detonations; [deleted].

[Charts deleted.]

Charts 1 and 2 depict two of the major threats. The point I would like to stress is the short time available for warning, attack assessment, and decision by the National Command Authority. [Deleted] With an intercontinental ballistic missile (ICBM) attack from the Soviet Union, the time is [deleted] but it is still an incredibly short time for the decision-making process.

The other threats must also be taken into account—some we understand relatively well; others are shrouded in great uncertainty. For example, we know that the Soviets have under development an antisatellite interceptor system capable of targeting satellites orbiting at low altitudes. [Deleted.]

Soviet doctrine emphasizes use of electronic countermeasures against sensors and communications. Thus, we know that we must plan for and have counter-countermeasure capabilities and procedures. We do not know, however, the [deleted] will have on our C³ systems. We can model what we believe some of the effects will be, but empirical test data are largely unavailable.

With this background, I would now like General Ellis to discuss his views of the connectivity of our current strategic C³ systems.

II. BUDGET ANALYSIS

A. *The fiscal year 1982 Request.* For the next fiscal year, the Department is requesting [deleted] billion for strategic command, control, and communications (C³) programs—an increase of [deleted] percent over the FY 1981 amount. Chart 3 shows our strategic program in comparison with other command, control and communications efforts. As shown in Chart 4a, about 40 percent of the request will

be used for operations—operations and maintenance and military personnel—of existing facilities and systems, which employ approximately 14,800 personnel. About 35 percent of the FY 1982 request will be expended for investment—procurement and construction of equipment and facilities—and 25 percent will be used to develop, test, and evaluate new capabilities.

C³ RESOURCES -- FY 82

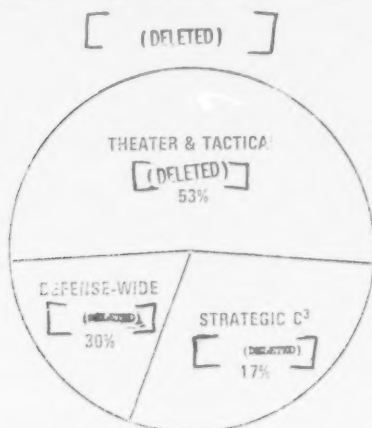
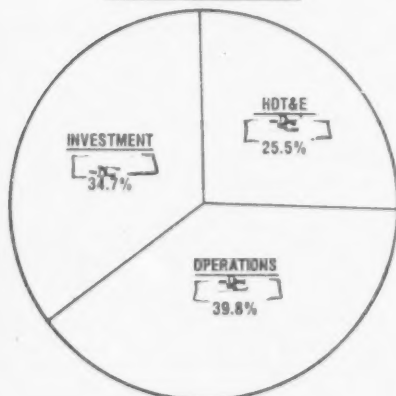


CHART 3

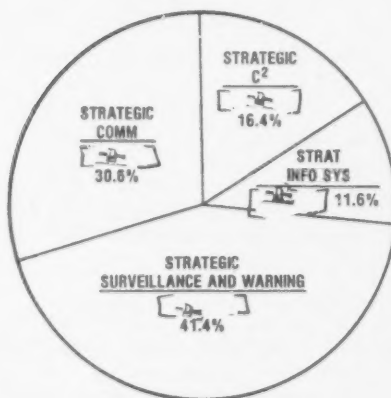
STRATEGIC C³ FY 82 BUDGET REQUEST TOA — [(DELETED)]

FY 1982
BY APPROPRIATION



(a)

FY 1982
BY MISSION AREA



(b)

CHART 4

These funds will be used to support four mission areas:

Strategic Command and Control, which provides the facilities and personnel to support senior military commanders and the National Command Authority in carrying out the planning, situation evaluation, decision-making and force-direction functions needed for effective force control;

Strategic Surveillance and Warning, which provides the sensor systems needed for warning and assessment of attack and assessment of retaliatory strikes;

Strategic Communications, which provides the links for conveying sensor and force status data to the command centers, for interconnecting command centers, and for transmitting orders to the forces; and

Strategic Information Systems, which provides automatic data processing capabilities that support the first three areas, for assimilation and evaluation of warning and force status information, to assist in formulating of force employment plans and targeting, and to expedite the several communications processes.

Chart 4b depicts the distribution of the requested funds over these four mission areas. Over 70 percent of these funds will be devoted to the communications and surveillance and warning areas. I will add, to highlight the emphasis we are placing on meeting requirements for connectivity and warning, that the requests for these two areas include [deleted] percent of the investment funds and [deleted] percent of the research, development, test, and evaluation funds of the total funds requested for strategic command, control, and communications.

B. Trends and Relationships. Chart 5 [chart deleted] portrays past and projected expenditures for strategic command, control and communications. Operations expenditures are expected to increase by about 8 percent per year over the fiscal year 1982 to fiscal year 1986 period—essentially zero real growth. Conversely, fiscal year 1982 represents the beginning of a period of substantially increasing investment expenditures, relative to prior years, and expansion of efforts to develop new and enhanced capabilities. Over [deleted] percent of the investment and development resources [deleted] will be used for the communications and surveillance and warning areas.

Chart 6 [chart deleted] compares resource trends for defense command, control and communications programs with a constant-dollar profile and with the overall defense budget. Since fiscal year 1980, the constant-dollar profile shows real growth through fiscal year 1983, and over this period, the program has represented a fairly constant share—between 5.5 and 6 percent—of the DOD budget, but that share declines in the outyears.

As shown in Chart 7 [chart deleted], the fiscal year 1982 funding request for strategic command, control and communications represents approximately 11 percent of defense expenditures for strategic weapon systems in fiscal year 1982. The Committee is well aware of the need to improve the survivability and capabilities of the strategic forces. There is a corresponding—and compelling—need to ensure that our means for strategic force management are commensurate with the capabilities we are developing for the weapon systems and the requirements for national security. After describing plans for our major programs in fiscal year 1982, I will review the implications of current policy and the steps we are taking to address those implications.

III. MAJOR PROGRAMS

A. Strategic Command and Control. Our major program in this area is the E-4B Advanced Airborne Command Post; highlights of this program are depicted in Chart 8 [chart deleted].

The E-4B is a modified Boeing 747 airframe, equipped with extensive command, control and communications equipment and facilities. It will be used as a National Emergency Airborne Command Post (NEACP) and by the Commander-in-Chief, Strategic Air Command (CINCSAC), during and after a strategic nuclear war to provide survivable, flexible battle management of our strategic forces. To this end, it will be equipped with powerful communications systems (including a high-power LF/VLF transmitter and UHF and SHF satellite communications terminals) and information systems which facilitate timely decision-making and dissemination of action messages (communications processing, data assessment and display, option definition and assessment, and decision implementation equipment). Due to its mobility and its hardening against nuclear effects, the E-4B can survive and function effectively well beyond an initial nuclear attack. Its communications equipment will provide greater assurance of connectivity within the strategic C³ system and to the forces, in the face of jamming and the adverse effects of nuclear detonations on less capable links. The E-4B will be our primary strategic command center [deleted].

We plan to procure a fleet of six E-4B aircraft, to be used by both the NCA and CINCSAC. We have one E-4B now serving the NCA. Our existing three E-4A aircraft (a less capable and less survivable version of the E-4B) will be upgraded to the E-4B configuration and delivered to the Air Force in 1983, 1984 and 1985. To complete the six-aircraft fleet, we plan to procure two new E-4B aircraft, which will be delivered in 1986 and 1987. [Deleted.] Full operational capability, for both the NEACP and CINCSAC missions, will be achieved in July 1987, when the sixth E-4B is delivered.

B. *Strategic Surveillance and Warning.* Our deterrence is strengthened if potential adversaries know that we can detect, assess and react appropriately to an attack, and can evaluate the effects of retaliatory strikes for planning subsequent responses. To achieve these contributions to deterrence, sensor systems have been developed and deployed which provide missile attack warning and assessment, bomber and cruise missile warning, and nuclear detonation (NUDET) detection. Evolutions in the Soviet threat, with changes in strategic force employment strategy, and the very short time available for selecting the initial response to an attack will severely tax our warning and assessment capabilities, and improvements in survivability, reporting reliability, and timeliness and the kinds of information needed for decision-making will be needed. Consequently, changes are being proposed to strengthen the strategic surveillance and warning system. I will now discuss the most important of these activities.

1. [Deleted] (*Satellite Early Warning System*). Our primary missile attack warning system today consists of three [deleted] geostationary satellites [deleted] in the eastern hemisphere and [deleted] in the western hemisphere) and [deleted] fixed ground processing stations, [deleted] satellites use infrared sensors to detect ICBM and SLBM launches.

Extended survivability of U.S. tactical warning and attack assessment systems is becoming a matter of increasing importance, arising from the need to provide information for the management of strategic forces during the pre-, trans-, and post-attack periods, including escalation control, orderly and controlled termination of conflict, and management of residual and reserve forces. This is especially true in a period when survivability of the bomber force against SLBM attack relies upon the receipt of timely warning, and when perceived survivability of the ICBM force is increasingly threatened by Soviet improvements in the number and accuracy of their ICBM systems.

Consequently, the fiscal year 1982 [deleted] program, depicted in Chart 9 [Chart deleted] emphasizes improved survivability for both the ground and space-based segments of the [deleted] system. [Deleted] we plan to deploy [deleted] Mobile Ground Terminals (MGT's) for reception and processing of [deleted] warning data, thus reducing our dependence on vulnerable fixed ground stations. [Deleted.]

Survivability improvements for the [deleted] satellites themselves will be incorporated during production of replacement satellites. [Deleted.]

In addition to these survivability enhancements, changes will be incorporated [deleted] to provide increased sensitivity [deleted].

The fiscal year 1982 request includes [deleted] for [deleted] Mobile Ground Terminals [deleted]. The procurement budget is being submitted requesting a block buy of four satellites, starting in fiscal year 1982, with incremental funding for the satellites through fiscal year 1986. This method of procurement will save over \$130 million for the four-satellite buy, relative to the standard method of full-funding the procurement of one per year. We recognize that incremental funding of procurement monies is an exceptional action, but we firmly believe the approach is warranted and solicit your active support and approval. The mission need is clear and compelling, there are no practical system alternatives, and the program has proven management capability.

2. *Attack and Strike Assessment.* Strategic surveillance also includes the capability to monitor effects of nuclear attacks against us, and retaliatory strikes by our weapons against enemy targets. The need for these capabilities is intensified by our doctrine of flexible response and the attending requirement for means to [deleted]. Real-time assessment of nuclear detonations anywhere in the world will be provided by the Integrated Operational NUDETS Detection System (IONDS). Chart 10 [Chart deleted] presents highlights of the program. IONDS sensors will be installed on satellites of the NAVSTAR Global Positioning System (GPS), giving us the first truly distributed—and therefore survivable—space-based strategic surveillance system. [Deleted].

IONDS/GPS will significantly increase our capability for accurate and rapid reporting of nuclear detonations. IONDS/GPS will have worldwide coverage

and is being designed to provide nuclear trans- and post-attack damage assessment information to the NCA in a nuclear war, including protracted global conflict, to support force management decisions. The system is also being designed to transmit worldwide nuclear detonation reports directly to airborne command posts. Nuclear test ban monitoring and intelligence collection will be supported in peacetime.

[Deleted], I have chosen to discuss this sensor development here because it is vitally important to our strategic surveillance and warning capability [deleted].

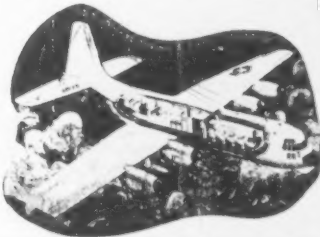
3. *Bomber and Cruise-Missile Attack Warning.* The North American air-defense system, operated jointly by the U.S. and Canada, includes ground-based and airborne radars and interceptor forces. The ground-based systems are: [deleted] District Early Warning (DEW) Line radars along the arctic perimeter; [deleted] radars of the PINETREE Line across central Canada; 13 Alaskan Air Command radars; and the Joint Surveillance System assets located around the periphery of the Mainland US. These radars are all limited to line-of-sight coverage and are insufficient to insure detection of low-altitude penetrators. [Deleted] Airborne Warning and Control Systems (AWACS) E-3A aircraft provide localized all-altitude coverage. Assigned interceptor forces consist of approximately 315 Canadian and US fighters. Augmentation of these elements available from general purpose forces includes [deleted] fighters and [deleted] AWACS aircraft.

Today the North American air defense system is severely limited in its ability to provide adequate warning, surveillance and active defense against current Soviet bombers and cruise missiles. Soviet bombers flying at low altitudes could penetrate undetected through gaps in radar coverage over Canada and our ocean approaches. Programmed AWACS aircraft will not be maintained on continuous airborne alert [deleted].

At OSD request, the Air Force has prepared an Air Defense Plan to address our critical needs. We are currently reviewing the Air Force plan and anticipate forwarding it with constructive comment to the Congress by April 1981. [Deleted.] We have programmed major improvements to the aerodynamic threat warning system. For all-altitude detection of bombers approaching the east and west coasts of North America, the fiscal years 1982-1986 program includes funds for two Over-the-Horizon Backscatter (OTH-B) radars with initial operational capabilities schedules for fiscal year 1984 and fiscal year 1986. [Delete.] Our options for improving warning of bombers attacks from the north include upgrading the DEW Line with modern, minimally and unattended radars to create an Enhanced DEW Line (EDEW); and a [deleted] OTH-B radar. Testing of the experimental OTH-B radar in Maine should allow us to decide between these options by the end of this year. [Deleted.]

C. *Strategic Communications.* Our highest priority needs in the strategic communications mission area are for assured means to deliver emergency action messages to the forces, and for links to the forces for reconstitution during protracted nuclear conflict.

COMMUNICATIONS TO THE FORCES TACAMO



- SURVIVABLE AIRBORNE COMMUNICATIONS RELAY TO STRATEGIC SUBMARINE FORCE

- SPECIALLY CONFIGURED EC-130 AIRCRAFT

(DELETED)

MILESTONES

- FOC (18 - AIRCRAFT FLEET): FY 83

FUNDING

- FY 1982 - \$181 MILLION
- FY DP - \$825 MILLION

- EMP HARDENING
- FLEET EXPANSION [] TO 18 AIRCRAFT FOR RELAY TO PACIFIC TRIDENT FORCE
- AFSATCOM/FLTSATCOM COMMUNICATIONS
- SERVICE LIFE EXTENSION PROGRAM TO EXTEND AIRCRAFT LIFE []

1. **TACAMO.** The TACAMO program, highlighted in Chart 11, provides our most survivable and endurable communications link from the National Command Authorities and the nuclear-capable CINCs to our Fleet Ballistic Missile (FBM) submarine forces. TACAMO is a fleet of EC-130 communications relay aircraft, which receive messages over a wide variety of communications links (ranging from LF/VLF to [deleted] satellite), and relay these messages to [Deleted] FBM submarines using a very high power VLF transmitter.

At present, we have [deleted] TACAMO aircraft: [deleted] in the Atlantic providing an around-the-clock airborne guard, [deleted] in the Pacific providing part-time airborne guard, three in conversion or depot maintenance status (to upgrade their capability and extend their service life), and [deleted] R&D testbed aircraft. By 1983, [deleted] additional [deleted] aircraft will be added to the fleet, bringing the Pacific squadron to a total of [deleted] aircraft, and providing full-time airborne guard capability in the Pacific area.

Some of the existing TACAMO aircraft are over-age and must be replaced. We are planning to procure nine replacement C-130 airframes during fiscal year 1982 through fiscal year 1985, and fit them out with C3 equipment removed from the wornout EC-130's. The entire TACAMO EC-130 force will be hardened to withstand the effects of electromagnetic pulses which result from nuclear detonations, thereby increasing the assurance that connectivity to the FBM forces will be maintained [Deleted]. This program to reinforce current TACAMO capabilities will be completed by fiscal year [deleted].

In fiscal year 1982, we have budgeted \$180.6 million for TACAMO procurement (including two replacement C-130 airframes), modifications (e.g., the Service life extension program and communications enhancements), spares, military construction (upgrade of the TACAMO base in the Pacific to accommodate [deleted] TACAMO aircraft), operations, military pay and R & D. Over the years fiscal year 1982 through 1986, we have programmed a total of \$824.6 million for the TACAMO program. [Deleted.]

2. *The Extremely Low Frequency (ELF) Communications Program.* The TACAMO program I have just discussed employs the VLF/LF radio bands to deliver emergency action messages to the Fleet Ballistic Missile submarines. Reception of these messages requires the submarine to trail an antenna at, or very close to, the ocean surface because VLF/LF signals cannot penetrate more than a few feet into the ocean. Requiring the submarine to maintain close proximity to the surface constrains its operational flexibility—the depth and speed at which it patrols—and can degrade its capability to avoid detection by potential anti-submarine warfare sensors. In an effort to mitigate these consequences, we have been developing a transmission system which employs the Extremely Low Frequency (ELF) band. Operating at a carrier frequency of 50 to 100 Hz, the ELF signal can penetrate hundreds of feet into the ocean, and can be used to alert the submarines and to deliver short operational messages while they are operating at depths and speeds which preclude reception of other communications.

The ELF system is not envisioned to survive direct attack, although the propagation medium is very stable in the event of nuclear detonations. For a number of reasons, the system will be difficult to jam. It will not replace the TACAMO and other links which provide higher data rates needed for emergency action messages and other communications, nor will it provide any direct report-back capability.

In acting on the 1981 Department of Defense budget, the Congress made available \$5.2 million in research and development funds, and required the President to provide plans for deploying an operational ELF communications system by April 1, 1981. We anticipate that the President will make a decision prior to that date.

3. *Satellite Communications to the Strategic Forces.* Our current satellite relay system for communicating with the strategic nuclear forces is based on use of transponders on the FLEETSATCOM and Satellite Data System (SDS) spacecraft, and we will incorporate such a capability in the Defense Satellite Communications System (DSCS) III and LEASAT spacecraft. These transponders will provide near-global coverage from airborne and ground-based command posts to SAC bombers and tankers, ICBM launch control centers and RC-135 strategic reconnaissance aircraft; [deleted]. The links provided employ UHF transmissions from the spacecraft to the airborne and [deleted] force elements, [deleted].

Recently, we defined a new architecture for military satellite communications through the early 1990's. Space segment features with implications for strategic communications are as follows.

a. *Existing and Programmed Satellites.*

DSCS III—[deleted].

LEASAT—service as currently planned [deleted].

FLEETSATCOM—no change.

SDS—capability as planned [deleted].

b. [Deleted.]

In addition, the DOD architecture calls for continued planning and development [deleted].

D. *Strategic Information Systems.* As I mentioned earlier, information systems—automatic data processing (ADP) equipment—form an integral part of the strategic command, control and communications system, and pervade the entire Worldwide Military Command and Control System (WWMCCS). WWMCCS serves the National Command Authorities and senior military commanders across the total spectrum of defense planning and operational activities from day-to-day and crisis operations, through conventional conflict, to general nuclear war. In several respects the standards of performance—timeliness and reliability, for example—that must be met by the WWMCCS Information System are set by its role in strategic command, control and communications.

The use of the WWMCCS Information System, involving 83 Honeywell 6000-series computers at 26 sites, is growing and it is expanding in the breadth and depth of its operational applications. This expansion is occasioned to a large degree by the availability of a WWMCCS Intercomputer Network which provides a high-speed, high-capacity digital data communications capability among 20 of the sites. The WWMCCS Information System is expected to continue to grow both in numbers of sites and services provided as users and system operators gain more experience with WWMCCS ADP and network applications.

There are, however, certain deficiencies in the present information system, especially in its support of time-sensitive crisis applications. In addition, rapid advances in ADP architecture and in hardware and software technology have created a situation in which the installed Honeywell hardware and system software are becoming technically obsolete, and the current system will become increasingly difficult and uneconomical to support logistically within ten years. Consequently, a major modernization of WWMCCS ADP and other elements of the WWMCCS Information System must be planned now and implemented. Replacement of the ADP hardware alone will not be sufficient; conversion and upgrades of much of the WWMCCS software will be required both to meet expanding operational needs and to take full advantage of the new hardware capabilities. During the transition, existing capabilities must be retained, necessitating an evolutionary approach to modernization.

Two major architectural decisions for the required modernization have not been made. The first relates to the location or disruption of ADP equipment serving the WWMCCS. The decision here is to modernize the ADP at each site rather than implement new centralized, regionalized or other ADP arrangements, which redistribute the location of the ADP resources and involve a considerable degree of remote operation and shared facilities. The second decision relates to the type or design of the ADP to be installed at each site, and was based on an assessment of the current architecture and desirable modernization features. This assessment led to the following conclusions:

There is no need for the same or simultaneous modernization of all of the WWMCCS ADP configurations supporting all functions at all sites;

Hardware and software standardization is essential for functions common to multiple sites, but a tailored, non-standard, approach to modernization of most command unique functions is acceptable;

Priority should be given to those areas where current performance is less satisfactory, with special early attention to the need for providing a very reliable, secure, high-capacity intercomputer communications capability; and

A phasing of the modernization effort would permit the cost to be broken into manageable pieces, and facilitate a smooth transition.

The selected nodal architecture has been termed the "functional family" approach. It departs from the current architecture and envisions a distributed data processing system at each site rather than concentrating the processing load in one or two large central machines. At each site, a local network would serve to inter-connect the various equipments and ease the transition process. This approach permits standard hardware and software treatment of key functional families which are common to many sites, but allows tailored, site-by-site treatment of command-unique applications at individual sites. To the extent

that the functional families are independent of one another, their modernization schedules may be phased to occur at different times, easing the operational problems on the sites as well as budgetary pressures. While the basic architectural decisions have been made, other issues remain to be addressed in the near future. Definition and specification of operational and information system requirements for the new system are proceeding in pace with the architectural activities.

Near-term modernization of the ADP used for tactical warning and attack assessment functions is an urgent requirement and one whose solution should not be constrained or otherwise affected by the mid-to-long term functional family approach. Accordingly, the Air Force has established a new Systems Integration Office at the Aerospace Defense Command to plan and engineer the necessary improvements to the ADP of the command and control systems involved: the NORAD Missile Warning and Space Surveillance System, and the Command Center Processing and Display System. This separate activity is proceeding with high priority.

Last October Senators Hart and Goldwater released an excellent report on the false missile alerts experienced last year from our missile attack warning system. We have been evaluating the recommendations and suggestions contained in the report, and at Senator Stennis' request, will be providing later this month our assessment of the projected costs and benefits incident to any realignment of mission responsibilities among the involved commands. We are also engaged in discussions with the General Services Administration to determine if the ADP requirements approval procedures for critical command and control processes such as the WWMCCS Information System and the missile attack warning function can be expedited and simplified.

Preliminary cost and schedule estimates have been prepared for the selected functional family approach. They are very tentative at this point, and focus only on acquisition (R&D, hardware and software procurement) costs. At this time, an acquisition expenditure of 1.0 to 1.3 billion dollars is indicated, although this could grow by several hundred million dollars if the quantity of command-unique software to be converted has been seriously under-estimated. This total compares with some \$40 million for acquisition in the FY 1982 WWMCCS ADP budget of about \$200 million. Extrapolation of this level over a ten-year period indicates an incremental acquisition cost of \$600-900 million for the modernization.

The schedule calls for continued planning and requirements definition in FY 1982. Specification preparation and source selection activities will extend through 1986, with the phased acquisition, test, and installation of most new hardware and software between 1985 and 1990. The portion of the modernized system which provides such command support capabilities as the local network, automatic message handling and terminal support capabilities will be procured first, and serve as a cornerstone for the entire phased approach. All of this will build upon the currently-planned ADP and WWMCCS Intercomputer Network upgrades to field a modern communications and user support capability. The functional families and the command-unique applications will follow.

To provide stronger and more centralized management and direction of all WWMCCS Information System modernization activities, broad programmatic, technical, and fiscal responsibilities will be assigned to a newly created WWMCCS Information System Joint Program Manager. The Joint Program Manager's office will be activated by mid-1981 and report through the Joint Chiefs of Staff to the Assistant Secretary of Defense for Communications, Command, Control and Intelligence. For the acquisition of new hardware and software, a new system project office will be established by the Air Force. Additional detail is contained in the report "Modernization of the WWMCCS Information System," which was provided to the Congress early last month.

IV. NATIONAL POLICY IMPLICATIONS

The strategic command, control and communications system of today consists of elements—such as the Minimum Essential Emergency Communications Network—which were designed to support execution of a major retaliatory strike in response to a major nuclear attack against the United States. Recent policy developments, embodied in Presidential Directives 53, 58 and 59, impose greater demands and additional requirements, on the system. I will now review these and related developments, comment on their implications for strategic command, control and communications, and summarize some initiatives we are taking to address the new requirements.

A. *Telecommunications.* A number of recent assessments have been made on the vulnerability of the nation's telecommunications capability and resources to a nuclear attack. These assessments use current information regarding the Soviet nuclear offensive capability and do not specifically assume targeting of telecommunications resources. Results show that essential command and control communications can be [deleted].

This nation is unique in that unlike most countries the telephone networks and facilities are privately owned. They also have the characteristic of being designed largely on an economic basis, to maximize service at minimum cost. One consequence is that the major telecommunications switching and transmission facilities and nodal points are concentrated in or near major target areas. Regulatory actions by the Federal Communications Commission and proposals by Congress to deregulate some aspects of the telecommunications industry will increase the vulnerabilities. Prior to 1970, AT & T had a virtual monopoly on the telecommunications industry. [Deleted.]

In its 1978 Annual Report to the Executive Office of the President, the National Communications System addresses these matters in detail, and noted the lack of a national security telecommunications policy and the fact that the situation would not improve if the telecommunication industry continued the trends that were being established.

The "National Security Telecommunications Policy (PD/NSC-53)" of November 15, 1979, stated the telecommunications objectives for satisfaction of priority national security needs and set forth principles for national communications assets to meet those objectives. The primary emphasis of those principles is to increase the utility, connectivity, restorability and survivability of common carrier and industry private-line networks. The National Communications System was given the responsibility to implement these principles. The Secretary of Defense is the Executive Agent for the National Communications System.

To meet these responsibilities the National Communications System staff works closely with the Federal Emergency Management Agency, other Government agencies, and the communications industry. That staff has assessed the vulnerability of the commercial carrier system, and the impact of this vulnerability on national security, and has developed possible guidance to be issued to commercial common carriers and Government agencies to reduce this vulnerability.

There are four categories of issues pertaining to the overall problem of common-carrier vulnerabilities and deficiencies and how to reduce these deficiencies through government initiatives. These categories are: legal and regulatory constraints; carrier inter-connection proposals; and economic and financial factors bearing on implementation strategy. The approach being taken to resolve these issues entails near-term and mid-term initiatives. Near-term initiatives require financial resources, but no policy or regulatory change. The mid-term initiatives involve regulatory, legislative and policy changes as well as significant dollar resources.

B. *Continuity of Government.* [Deleted.]

C. *Strategic Force Employment.* Presidential Directive 59 concerns employment and targeting policy for the strategic nuclear forces, and calls for: [Deleted.]

The Directive also states that the countervailing strategy embodied in the foregoing policy imposes requirements in the strategic command, control and communications system, and that improvements in our forces must be accompanied by improvements to that system. The needed improvements lie in the areas of increased flexibility and higher assurance of command-and-control survivability and long-term endurance.

More specifically, the strategic command, control and communications system must now support: [Deleted.]

I will now describe the initial steps we have taken to meet these new requirements.

D. *Enduring Strategic Command, Control and Communications.* A number of on-going programs are aimed at alleviating existing deficiencies in the capability of the current WWMCCS to provide essential command, control and communications support during the pre and trans-attacks phases of general nuclear war. [Deleted.]

The Enduring WWMCCS Program addresses these deficiencies by examining alternatives for extending the survivability and endurance of [deleted].

In the Enduring WWMCCS, major emphasis will be on building prototype hardware and feasibility models to demonstrate the candidate concepts in field tests and exercises. This will provide data on the technical risk, cost and operational utility so that investment decisions can be made. The fiscal year 1982 budget request for this program is \$69.8 million dollars.

V. CONCLUSION

Mr. Chairman and members of the Committee, I want to thank you for the opportunity to describe our strategic command, control and communications system, its current capabilities, and the steps we need to take to improve it and meet the needs of national security policy. With your support and guidance, we can assure that the system, together with improved forces, meets the highest priority requirement of the Department of Defense—deterrence of strategic nuclear conflict.

STATEMENT OF GEN. RICHARD H. ELLIS, USAF, DIRECTOR, JOINT STRATEGIC CONNECTIVITY STAFF, JCS; COMMANDER IN CHIEF, STRATEGIC AIR COMMAND; DIRECTOR, STRATEGIC TARGET PLANNING, JCS—Continued

General ELLIS. Mr. Chairman, I would first like to describe a staff—new to this committee—that has been organized and in business only about 6 months. It came about as a result of a study that Senator Nunn referred to in 1979, which described the need for an activity of this sort.

This is a joint staff—Army, Navy, Air Force, Marine Corps, civilian—very small at the moment, only 21 authorized people. The commander of SAC was named as director. Admiral Paul Tomb presently holds the vice director's slot.

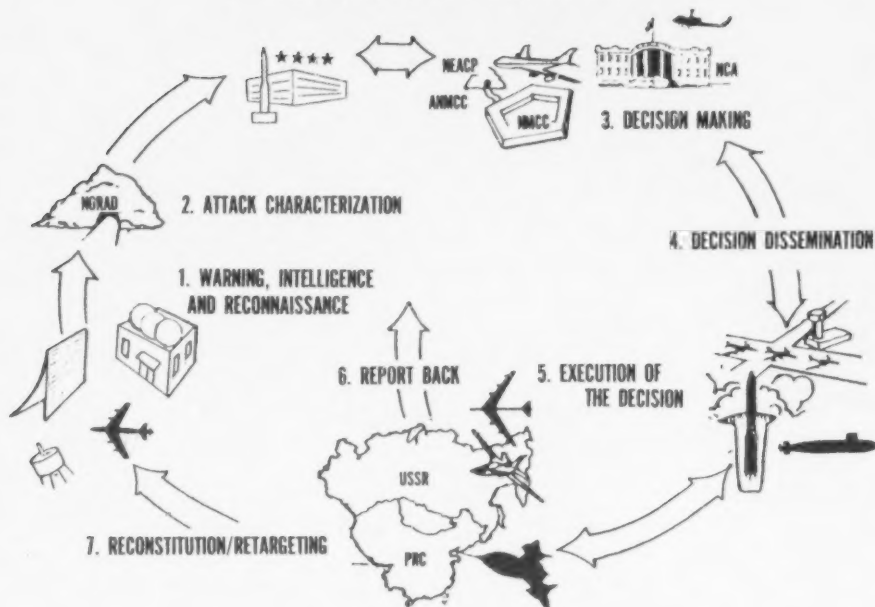
Our job is solely to monitor and to recommend improvements in strategic connectivity. We have no forces assigned to us. We have no other responsibility. I compare it with the Joint Strategic Target Planning Staff that was organized 20 years ago and since that time, in my opinion, has risen to the stature of one of the finest military staffs in the world.

One of the successes of that staff is the fact that it is able to concentrate on a single objective; that is, the writing of this Nation's nuclear war plan. I hope that it does not take us 20 years to get the connectivity staff to the same level of proficiency. I do not think that it will.

We have the attention of the Washington community. We maintain very close contact with the other nuclear planners and chiefs. To give you a feel for some of the things we do, I refer you to the chart. We are implementing this by taking the recommendations of the study that was done in 1979, updating them, and then we run an audit of those accomplished against those that have not been implemented. These recommendations have to do with hardware, software, procedures, and that sort of thing.

This new staff reports directly to the Joint Chiefs of Staff and we always keep the other planners informed of where we stand. I expect great things out of the staff in the future, Mr. Chairman, and I think that it will make its mark in this endeavor.

MILITARY STRATEGIC CONNECTIVITY



1

As indicated in the opening statement, I would like to talk a little bit about what we in the JSCS define as military connectivity. It is composed of some seven elements. Obviously, everything focuses on step No. 3, decisionmaking. The objective is to get to the National Command Authority (the NCA) the information he needs to make a coherent, useful decision, and to get that decision to the forces for execution.

This cycle starts with General Hartinger's responsibilities. That is, providing warning intelligence—surveillance and reconnaissance—to him from our sensors, both satellite and radar, and other such sources that may be available. This information would be transmitted expeditiously to his headquarters at NORAD. There, his responsibility is, as rapidly as possible, to characterize the threat coming against the United States.

At this point, if I might digress a moment, we have come a long way since the early days of nuclear planning when we were concerned only with the initial attack. We designed our command and control system to launch the force in a massive strike. Today, for all practical purposes, that is the connectivity that still exists, with some refinements.

In those days, we were only worried about getting the message out. We were not worried about survival of that system. Today, our nuclear strategy has changed under national directive to the point where we are required to have a flexible plan, to have options available to the President, to have an enduring capability that can last for an indefinite period, and to be able to exercise control over a reconstituted force after perhaps several exchanges.

Having made the attack characterization, or at least started the process, General Hartinger—we will go into this in more detail later—provides the most current information that he has available to Washington and to certain other locations.

The NCA is brought into the decisionmaking process in step three. After a decision is made, it then becomes a problem of dissemination. We will show you that is not automatic in the sense that the President just presses a button, as is generally imagined.

It is very rapidly distributed to the commands, then to the crews and there is considerable redundancy in the means for getting that decision to the crews. Then, of course, the fifth step is the execution of that decision. Having done that, our problem is to evaluate what we have done to our adversary and what our adversary has done to us. [Deleted.]

This cycle can happen in a matter of moments or it can happen over a prolonged period of time. The ultimate, of course, is to recognize that we are under attack, to characterize that attack, get a decision from the President, and to disseminate the decision to the forces prior to the first weapon impacting upon the United States.

Senator GOLDWATER. General, could I interrupt one moment?

General ELLIS. Yes, sir.

Senator GOLDWATER. Once the President has given you a decision on [deleted].

General ELLIS. The National Command Authority, Senator Goldwater, retains the authority for the use of a nuclear weapon. We look at that as the whole process.

Senator GOLDWATER. I am talking about when you decide you would like a [deleted], do you have to ask the President for permission?

General ELLIS. Yes, sir.

Senator GOLDWATER. You do.

General ELLIS. I would make it in the form of a recommendation [deleted].

[Chart deleted.]

I would like now, if it pleases the committee, to show you what we refer to as time lines—what this decision process looks like in terms of all that has to be done and the general timing within which we have to do it.

One of the driving facts, of course, is the ICBM flight time to the United States. [Deleted.]

I will ask, at this point, Admiral Tomb to describe the time line and the procedures that constitute the process. Then General Dickinson will describe some of what will happen to our connectivity system as it comes under attack. Then Admiral Tomb will show you under the scenario that has been approved by the JCS, [deleted].

[The prepared statement of General Ellis follows:]

PREPARED STATEMENT BY GEN. RICHARD H. ELLIS, USAF, DIRECTOR, JOINT STRATEGIC CONNECTIVITY STAFF, JCS: COMMANDER IN CHIEF, STRATEGIC AIR COMMAND; DIRECTOR, STRATEGIC TARGET PLANNING, JCS

INTRODUCTION

Mr. Chairman and Members of the Committee, I welcome the opportunity to appear before this committee and discuss the importance of military strategic

connectivity to national security. Last month, I reported to the committee on SAC's strategic force posture and briefly touched on my concerns regarding strategic connectivity—which is often referred to by the generic term "C³I" . . . standing for Command Control, Communications and Intelligence. Today, I appear as the Director of the Joint Strategic Connectivity Staff (JSCC)—a newly formed agency of the Joint Chiefs of Staff (JCS)—and will expand on my previous remarks within the context of C³I.

America's deterrent and warfighting capability is dependent upon a network of sophisticated, high-technology C³I strategic connectivity systems. This report will examine what the term "strategic connectivity" encompasses, the results of our analysis regarding the current state and vulnerabilities of the military connectivity network and the more significant near-term solutions recommended by the JCS to correct some of these vulnerabilities.

THE JOINT STRATEGIC CONNECTIVITY STAFF

The creation of the JSCS was the result of a comprehensive connectivity study directed by the JCS that was completed in March 1979. Although responsible directly to the JCS, the JSCS has no command or force execution responsibilities. Rather, the Staff is tasked to analyze strategic connectivity systems and then make recommendations to the JCS concerning hardware and procedural issues that will enhance strategic offensive and defensive operational capabilities.

THE JSCS MISSION

To accomplish this broad mission, the JSCS is specifically chartered to:

Develop hardware/software and procedural recommendations to ensure optimal C³I interoperability, reliability, survivability, endurance, security, and efficiency.

Coordinate and review connectivity and operational procedures between the National Command Authorities (NCA), National Military Command Systems (NMCS) and the nuclear unified and specified commanders to ensure compatibility.

Recommend exercises to test Single Integrated Operational Plan (SIOP) [deleted] execution and termination procedures, as well as the adequacy and endurance of supporting C³I systems.

JSCS TERMS OF REFERENCE

The Terms of Reference for the JSCS expand the mission statement and are summarized below:

The JSCS will examine those warning and command control systems which provide the NCA with the capability to execute, terminate, and manage strategic nuclear forces through the pre-attack, trans-attack and post-attack phases. Within this context, the Staff will examine and continually review existing communications connectivity, warning and command control systems and associated procedures for endurance, adequacy, availability and timeliness, and make recommendations for improvements in each of these areas.

The work of the Staff will be limited to an examination of facilities, systems, and procedures that interconnect the NCA, NMCS, the nuclear CINC's and the nuclear executing commanders (bomber, submarine, and missile commanders). The JSCS will address those North American Air Defense Command (NORAD) warning systems—from sensor to user—that contribute to the timely execution and direction of strategic nuclear forces. The Staff will identify any deficiencies and provide recommendations to correct them.

The Director of the JSCS will make his recommendations directly to the Chairman, Joint Chiefs of Staff (CJCS). Direction of the JSCS will be through the Vice Director, who acts for the Director in maintaining the Staff.

The JSCS will be assisted by representatives from each of the nuclear CINC's. These representatives will coordinate the review of warning, command control and communications systems with their respective headquarters.

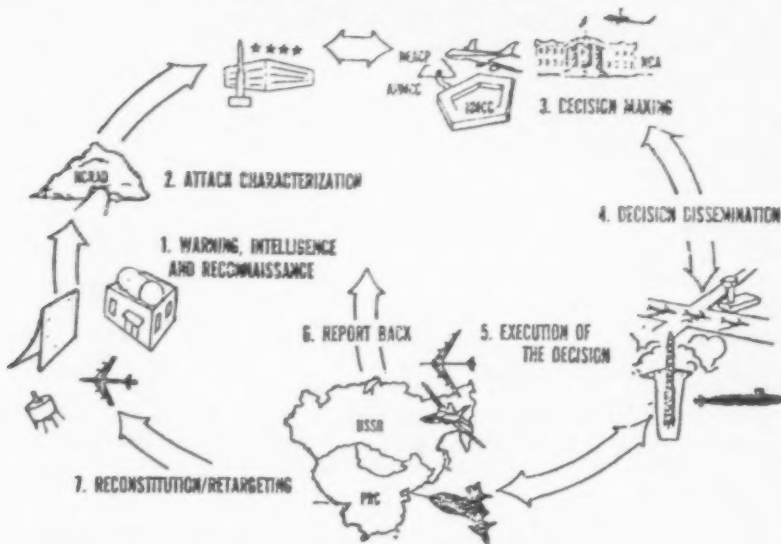
The JSCS will coordinate with the JCS, the Joint Strategic Target Planning Staff (JSTPS), the National Security Agency (NSA), the Defense Communications Agency (DCA), the Defense Nuclear Agency (DNA), the Federal Emergency Management Agency (FEMA) and other government agencies as required and directed.

STRATEGIC CONNECTIVITY

Because the full meaning of "strategic connectivity" is often misunderstood, it is important for everyone to understand the scope of the term and the manner in which it is applied to JSCS activities. The JSCS charter defines strategic connectivity as "the facilities, systems, and procedures that interconnect the NCA, NMCS, nuclear CINC's and nuclear executing commanders." A closer examination expands this to include the NCA, [deleted] the National Military Command Center (NMCC), the Alternate National Military Command Center (ANMCC), NORAD warning systems, the National Emergency Airborne Command Post (NEACP), [deleted] and all links and nodes that interconnect these facilities with the executing commanders of SIOP aircraft, intercontinental ballistic missile (ICBM) launch control centers (LCC), and ballistic missile submarines (SSBN).

FIGURE 1

MILITARY STRATEGIC CONNECTIVITY



With this definition as a starting point, let me briefly describe how the above elements coalesce to make up the functions of military strategic connectivity (Figure 1):

The lead element, attack detection, begins the connectivity network. Satellites and ground based radars in this network must provide detailed, unambiguous warning information . . . and provide it quickly.

Next, is attack characterization. After receiving detection inputs via survivable communications, the NORAD Missile Warning Center must analyze the attack and provide the NCA with both warning and assessment information [Deleted.] I will discuss this in greater detail later.

[Deleted] times also affect the length of time available for the third element of connectivity—the decision making process by the NCA. We are talking about [deleted] during which attack assessment information must be weighed, possible response options evaluated, and a decision made.

Then, once a decision is reached, an Emergency Action Message (EAM) must be formatted and disseminated to the forces in the field. The key links in this fourth element are the numerous components of the NMCS—including the nuclear CINC's' static and airborne command posts.

The fifth element is execution of the NCA decision. Here, responsiveness is critical. [Deleted.]

Once initial execution is complete, we must have sufficient feedback data and intelligence information to evaluate not only the effects of our retaliatory

attack on the enemy but also our own resources remaining to continue the war. [Deleted] and supporting communications and data processing are required to fulfill this sixth requirement of connectivity.

Finally, we need communications in the trans- and post-attack period to reconstitute our surviving forces, generate follow-on sorties and retarget our forces, as required. This complicated cycle is then repeated until hostilities are terminated.

THE CONNECTIVITY NETWORK AND ITS VULNERABILITIES

A better understanding of the relationship between the elements of connectivity can be seen through an analysis of current C³I connectivity [deleted].

The scope of our analysis covers the facilities, systems, and procedures that provide the NCA with information necessary to arrive at an execution decision and relay that decision to the SIOP forces in the field. Figure 2 [deleted] places in perspective the various actions of key C³I elements during a massive Soviet ICBM and SLBM attack. Let me now discuss in detail [deleted] each of the many activities that take place. Initial warning of an attack will be detected [deleted].

At Headquarters SAC and other selected CINC headquarters, initial detection of the attack will be received and actions taken to increase the posture of respective alert forces. [Deleted.]

Using these basic parameters, we can now see (Figure 5) how the functional capabilities of the key facilities and systems in the strategic connectivity network are affected [deleted].

NEAR TERM SOLUTIONS

There are a number of near-term actions, involving both procedures and equipment, that could significantly enhance the survivability of connectivity to our strategic forces. [Deleted.] JSCS recommendations involving programmatic actions fall into two categories: those requiring continued funding for ongoing programs and those requiring increased funding for programs that should be accelerated. Other recommendations will require only procedural changes in the operation of elements in the C³I network, some of which have already been implemented.

The system and hardware improvements that will require accelerated funding are directed primarily to the [deleted] because they are the most survivable resources presently available in the event of a nuclear conflict.

THE E-4B

[Deleted.] The E-4B, the military version of the commercial Boeing 747, has been hardened to survive EMP from a high altitude nuclear detonation. The E-4B also has a significantly improved communications capability over the older E-4A/EC-135 model aircraft. [Deleted.] There is presently only one E-4B out of a total of four E-4 type aircraft. [Deleted.]

SATELLITE COMMUNICATIONS

It is clear that a communications network, survivable through the entire spectrum of conflict, is necessary. Even full deployment of the Air Force Satellite Communications (AFSATCOM) program in 1983 [deleted]. The development of a survivable Military Satellite Communications architecture is required as the best solution for enduring, two-way connectivity stretching from the NCA to the forces in the field.

LF/VLF RADIO SYSTEM

The LF/VLF radio system on our WWABNCP and Navy TACAMO communications relay aircraft is [deleted] survivable means of communication in a nuclear environment. Accelerated funding should be provided to improve [deleted] this system for installation in all airborne command control aircraft and at key ground locations (LCC's [deleted]). Additionally, necessary funding and management attention are needed to ensure this system is thoroughly tested to provide interoperability [deleted].

NAVY TACAMO

The Navy TACAMO relay aircraft is a key link in providing survivable communications to our SSBN's. Increased funding is necessary to obtain additional aircraft to provide continuous airborne alert in both the Atlantic and Pacific. Presently, the Atlantic TACAMO orbit is the only orbit continuously airborne [deleted]. In addition, these aircraft should be protected against the effects of EMP.

THE EC-135

The backbone of our WWABNCP fleet is the EC-135, a military version of the Boeing 707 aircraft. [Deleted.]

THE JCS ALERTING NET

[Deleted.]

PROCEDURAL CHANGES

The list of recommendations in this area is short because many such changes have already been implemented as the result of previous connectivity studies. [Deleted.]

DOD CONNECTIVITY ORGANIZATIONS

Finally, of our strategic connectivity network is to effectively support national guidance, it is necessary to restructure the existing organization at the Secretary of Defense level to put strategic connectivity under a single authority reporting directly to the Secretary of Defense. Today's structure places policy issues under an Assistant Secretary, who is responsible to the Under Secretary of Defense for Policy. The programmatic aspects of strategic connectivity are under another Assistant Secretary responsible to the Under Secretary of Defense for Research and Engineering. Detailed study and evaluation are required to establish the organization to provide coherence to strategic connectivity policy, programs and funding at the highest level.

CONCLUSION

There are, of course, many other aspects of Strategic Connectivity which could be discussed. However, I believe the ones mentioned in this report are of greatest importance.

To realize the full potential of modernized strategic weapon systems in each of the military services, we must make corresponding improvements to the C³I systems that support them. The fragile nature of our current C³I network demands that this all important aspect of national security receive immediate attention.

Senator WARNER. Admiral Tomb.

**STATEMENT OF REAR ADM. PAUL D. TOMB, USN, VICE DIRECTOR,
JOINT STRATEGIC CONNECTIVITY STAFF, OFFUTT AFB, NEBR.**

Admiral TOMB. Mr. Chairman, I would like to take you through the facilities, steps, and procedures that are followed in the event of a massive nuclear strike to relay the information to the NCA and then what is involved in getting that information and decision process from the NCA to the operating forces.

[Deleted.]

Senator NUNN. Excuse me, just a minute, Mr. Chairman.

I thought that there was a reference to [deleted] possible minimum, by Dr. Van Trees a few minutes ago?

Dr. VAN TREES. Yes, sir, [deleted].

Admiral TOMB. [Deleted.]

Senator NUNN. What happens if you get NCA on there? You have a [deleted] and you get him on there in [deleted].

Admiral TOMB. [Deleted.] That is one of our problems.

Senator GOLDWATER. When I think of conference, I think of a group of people sitting down and tossing it around. Are not those conferences rather automatic?

If you can complete a conference in [deleted] that is a fast conference.

General ELLIS. Mr. Chairman, there is a procedure that has been defined. The purpose of that conference is to get a decision. [Deleted.]

Senator GOLDWATER. You really do not reach a decision?

General ELLIS. No, the President makes the decision.

Senator GOLDWATER. You are sitting there for somebody to ask you?

General ELLIS. Yes, sir.

Senator GOLDWATER. You ought to change the word conference. That sounds too long.

Admiral TOMB. To continue on the last point, I will use SAC as an example of one of the CINCS and of what is actually occurring.

As soon as they get the alert that there is an event taking place, his duty officer will alert the force to increase the posture of that force, and in the meantime monitor the [deleted].

That is essentially the systems, the procedures, and the functions that we go through.

Senator GOLDWATER. How long do those troops stay on duty wherever they are?

Admiral TOMB. All of these people are on duty at all times. The CINCS, of course, are on call [deleted]. There are duty officers at NORAD, National Military Command Center, the Alternate National Military Command Center, the White House Communications Agency, and SAC, 24 hours a day.

Senator GOLDWATER. [Deleted] can give you a warning?

Admiral TOMB. That is the projected earliest detection [deleted]. I will leave that question for General Hartinger to answer later, [deleted].

General ELLIS. If I could make one comment, Senator Goldwater, that I think is pertinent. [Deleted]. There are other things happening during that time period. [Deleted].

[Deleted] We can raise that posture to the point where the crews are sitting in the cockpit with the engines running.

We can actually move them to the ends of the runways, so that we can get them off the ground faster during the period. [Deleted.]

Senator GOLDWATER. At what point would you have your SAC bomber crews take off?

General ELLIS. [Deleted.]

General HARTINGER. Senator Goldwater, as General Ellis said, [deleted].

So, we look at every situation. We exercise it so that it will not be a new situation, whatever happens.

Admiral TOMB. If there are no further questions, I will be followed by Lieutenant General Dickinson.

Senator WARNER. General Dickinson?

**STATEMENT OF LT. GEN. HILLMAN DICKINSON, USA,
DIRECTOR, C³ SYSTEMS, OJCS**

General DICKINSON. I will discuss some of the conditions that our strategic C³ system must endure and the stresses that are put on that system.

Time: Peacetime.

Environment by time period: Power outages; equipment and software failures; people errors; natural events (aurora); peacetime missile launches; and sabotage.

In sequential order, the timeframes are shown on the first chart. First, a peacetime condition: I think that it is obvious that during normal day-to-day conditions, we have to cope with power outages from commercial supplementary power or failure from internal power, other kinds of equipment and software failures, and people errors. We have natural events, such as the aurora, that affect our radar systems that must be clearly identified as such, not as potential missile events. We have many peacetime missile launches, both Soviet and friendly, which go through the coverage areas of our system, and finally, there is some potential for peacetime disturbance and sabotage.

It is necessary to operate reliably and stay ready if this is to be a believable system, and hence, as you all recognize very clearly, and in light of the NORAD events of last year which you addressed in your opening remarks, we must correct any deficiencies. We are doing so.

The second time period, however, comes after the first [deleted].

Senator NUNN. How many [deleted] are you using there to achieve that effect?

General DICKINSON. [Deleted.]

[Deleted.]

Senator WARNER. General, the magnitude of those [deleted].

General DICKINSON. [Deleted.]

Senator WARNER. Does that chart also reflect reasonably well the scale, [deleted].

General DICKINSON. [Deleted.]

Senator WARNER. [Deleted.]

General DICKINSON. That is Omaha.

Senator WARNER. [Deleted.]

[Deleted.] In other words, is there reasonable accuracy?

General DICKINSON. That is not a significant effect.

Senator WARNER. That is not a relevant effect?

General DICKINSON. [Deleted.]

Senator WARNER. But is there an [deleted.]

General DICKINSON. [Deleted.] and that is not significant [deleted].

Senator WARNER. Not significant.

General DICKINSON. [Deleted.]

I will be followed now by General Hartinger who will discuss the activities that go on in threat warning and threat assessment area, and I will be back later to discuss priorities.

General ELLIS. Before General Hartinger, Mr. Chairman, if I may, Admiral Tomb will now show you [deleted].

Admiral TOMB. Recalling the last time line that we went through, I will go through and show what happens to those time lines, and what happens to our capability to transmit the emergency action message [deleted].

The yellow indicates the effect of the electromagnetic pulse—emp. [Deleted.]

The red indicates physical destruction. [Deleted.]

[Deleted] that General Dickinson referred to would occur [deleted].

Essentially, that is what happens to our command and control facilities after a massive ICBM attack.

Are there any questions?

Senator WARNER. No questions.

Admiral TOMB. General Hartinger.

STATEMENT OF LT. GEN. JAMES V. HARTINGER, USAF, COMMANDER IN CHIEF, NORTH AMERICAN AIR DEFENSE COMMAND—Continued

General HARTINGER. Sir, in describing our tactical warning and attack assessment system, I will show you our sensor systems, how they work, their limitations, and what our planned upgrades are.

[Chart deleted.]

This is our infrared early warning system which you have heard about already, [deleted].

Senator WARNER. General, I would like to get a point clear in mind here. When I looked over this material last night, I might have gotten a misimpression. Could we go back to this chart? These are your satellite systems.

It was my understanding when I looked at this last night that [deleted] that the information would be transmitted back, am I correct on that?

General HARTINGER. Yes, sir.

Senator WARNER. All right, now, assuming that there is an approximate flight time [deleted] minutes, depending on the impact—what is that?

General HARTINGER. An ICBM flight is probably 30 to 35 minutes.

Senator WARNER. I thought, when I looked at some of the charts, that it was shorter in a few areas simply because the length of the trajectory was shorter.

[Deleted.]

General HARTINGER. We would generally say 30 to 35 minutes for an ICBM problem.

Senator WARNER. Then, I was not able to quickly reconcile in my mind your statement a minute ago that you had x number of minutes.

Would you go back over that? In other words, you have two [deleted]. You have from 30 to 35 minutes to contact.

General HARTINGER. I think that what they were speaking of was after the launch, [deleted.]

Senator WARNER. You are talking about the corroborative information through the BMEWS system?

General HARTINGER. Yes, sir, and that would still be then [deleted.]

Senator WARNER. Now I understand.

General HARTINGER. Those were the IR sensors. Now, the rest of the sensors you see will be radar sensors. This is the BMEWS that

has been operated over 20 years from sites in Alaska, Greenland, and England. [Deleted.]

We have upgrades for this system. [Deleted.]

But our upgrades for BMEWS are to replace the 1950-vintage computers, to increase their discrimination capabilities [deleted] and to increase their [deleted] capacity. I will show you what that does for us in a couple of minutes.

This is our SLBM coverage chart. [Chart deleted.] These are all radars. Our two prime SLBM radars which became operational last year are at Beale and Otis, and they are phased-array radars. They look something like a football field. [Deleted.]

We have a phased-array radar looking south covering the gulf in these areas, and we have a conventional radar filling a gap there. PARCS is a radar from the old Safeguard antiballistic missile system. It is a very good radar [deleted].

The major upgrade needed for these systems is to [deleted.]

General HARTINGER. Mr. Chairman, I mentioned the need for the major upgrades to these systems, to the PAVE PAWS radars at Otis and Beale. [Deleted.] That is one program. [Deleted.]

To support that strategy in an effective way, we need the upgrades, the documented upgrades, that I have described, and we need your support.

[The prepared statement of General Hartinger follows:]

PREPARED STATEMENT BY GEN. JAMES V. HARTINGER, USAF, COMMANDER
IN CHIEF, NORTH AMERICAN AIR DEFENSE COMMAND

INTRODUCTION

Mr. Chairman and Members of the Committee: It is a pleasure to appear before this new subcommittee and provide my thoughts on major strategic issues as Commander in Chief, North American Air Defense Command and Aerospace Defense Command and my recently acquired responsibility—that of the Air Force Executive Manager for the Tactical Warning/ Attack Assessment (TW/AA) System.

I will discuss first, an overview of NORAD's current missile warning and attack assessment system with its capability and limitation; and second, the June false missile warning events, and subsequent actions taken to include activation of the System Integration Office (SIO), with responsibility for the technical integrity of the entire TW/AA System

TW/AA SYSTEM DESCRIPTION

The [deleted] consists of [deleted] satellites, ground processing and control stations and a communications processing/data distribution network. The satellites, [deleted] in the eastern and [deleted] western hemisphere, are configured to detect infrared radiation emitted by ICBM and SLBM boosters [deleted]. Initial warning of an ICBM attack is expected within [deleted] after launch and approximately [deleted] after an SLBM launch. This warning information is correlated with other sources at the NORAD Cheyenne Mountain Complex (NMC) and by means of high speed data and dedicated teletype lines is transmitted to [deleted] the JCS. These initial warning messages are the basis for the initiation of force and NCA/C³ survival actions.

[Deleted] Planned [deleted] upgrades, designed to improve the detection, data transmission and system survivability, include the deployment of multiple Mobile Ground Terminals, [deleted].

The Ballistic Missile Early Warning System (BMEWS) comprises a three-site radar system, on-site data processing and rearward communications links to the NMC. Site I is located at Thule, Greenland; Site II is at Clear, Alaska, and Site III (operated by the RAF) is at Fylingdales, England. The BMEWS provides warning and assessment information on ICBM attacks launched from the Sino-

Soviet landmass [Deleted]. Programs are underway to provide a degree of BMEWS modernization, particularly the replacement of 1950 vintage computers, [deleted].

PAVE PAWS phased array radars are located at Otis ANGB, Massachusetts, and Beale AFB, California. These radars provide warning and attack assessment coverage of SLBM launches [deleted].

The current SLBM detection and warning system also includes the AN/FPS-85 phased array radar at Eglin AFB, Florida, and the AN/FSS-7 radar at MacDill AFB, Florida, to cover threats from the Gulf of Mexico and the Atlantic. [Deleted.]

The Perimeter Acquisition Radar Attack Characterization System (PARCS) is a north-looking phased array radar located at Concrete, North Dakota, that provides radar coverage of SLBM attacks from near-arctic areas behind the BMEWS. It also provides [deleted] ICBM attack assessment information.

There are other system elements which support the current missile warning and attack assessment system. [Deleted.]

TW/AA SYSTEM OPERATION

NORAD employs a two-step process for identifying a missile launch and assessing the threat to the North American continent. [Deleted.]

[Deleted.] This is called dual phenomenology.

Dual phenomenology detection has been a fundamental and critical design feature of our missile warning system for many years and provides an important cross-check for providing unambiguous warning.

[Deleted.]

If the Soviets were to launch SLBMs and ICBMs separately or simultaneously, a sequency of detection and warning events would start [deleted].

Following detection, [deleted] sensors feed their data directly to the four major command posts (NORAD, SAC, NMCC, and ANMCC. Data from all other warning sensors, [deleted] are analyzed and the results transmitted [deleted].

TW/AA SYSTEM LIMITATIONS

This system has a good capability [deleted.]

General Ellis has described how [deleted.] I have covered [deleted] supporting PD-59 and our newly announced flexible targeting strategy.

JUNE FALSE MISSILE EVENTS

On 3 June, a chip on a circuit board malfunctioned, which resulted in a false missile warning indication being sent to SAC, NMOC and the alternate NMCC. [Deleted] the Missile Warning Officer in Cheyenne Mountain checked with the sensor sites worldwide and determined there were no missiles being tracked in the system. Some precautionary posturing actions were taken for survivability which is normal.

The system worked as it should because we had a man in the loop, and I can assure you that there will always be a man or woman in the computer loop, especially when the computer product is as important as it is at NORAD.

After the event, my computer analysts worked 40 straight hours but could not determine the cause. One bit of evidence was that the displays showed anomalies in that there were a lot of "2"s—20, 200, 220, 2000, 2200, etc. Therefore, we put instructions in the software—when you see those "2"s again, stop—and we put a data scope on the line to record the results. Then we informed our users that we were going back on that same computer line in an attempt to duplicate the fault—so that we could isolate and eliminate the cause. Needless to say, we could not stand to be subjected to similar faults day after day. On 6 June, under these controlled conditions we duplicated the fault, isolated the cause (the chip), and eliminated it.

After these events, we worked closely with JCS, the Air Staff and SAC in implementing hardware and software corrective actions to guarantee the reliability of the data exiting the NCMC.

Actions taken to return the NORAD Computer System (NCS) to normal operations are now complete. Communications data monitors are installed on each of the critical circuits to the forward users of NORAD's missile warning data. These include recording devices, computer printouts and alarms at key positions in the NCMC. To prevent these types of malfunctions from creating false missile warning events, an end-to-end communications validity scheme, called cyclic redundancy

check (CRC), was installed in the NORAD Computer System. Then, faults similar to the June incidents were induced and transmitted to the computers at the other command centers. The tests confirmed that the false messages were rejected by the other command centers because of the CRC.

As a result of these and other safeguards, after a 96-hour test period and with JCS approval, we returned to normal 427M operations on 24 November 1980. Since then continuous statistical data were gathered by us and our high-speed users, and analyses of this data showed that improvements made to the system have proved effective.

In addition, the NORAD Off-Site Test Facility, operational since September 1980, now provides for development and testing of 427M software and hardware without infringing on the operational computer system in the Mountain.

Future hardware and software improvements to the 427M system which are approved and funded include: an upgrade to the message processing computer (Honeywell 6050) of the Communications System Segment; implementation of a feedback protocol on the missile warning input and output lines; development of a Missile Warning Bypass to ensure that critical missile warning messages continue to be processed; implementation of a failover scheme for the missile warning processing function using the backup NORAD Computer System (NCS); and expansion of diagnostics for the multiplexer of the Communications System Segment.

Stemming from the June incidents, an 18-man Air Force team reviewed our operations to evaluate Air Force support of the TW/AA mission. As a result of this management review, the CSAF approved creation of a System Integration Office (SIO), operational on 1 January. The SIO charter is to provide overall management, end-to-end technical integrity, configuration control, and validation and testing for the entire TW/AA system—from the sensors to the ground stations to Cheyenne Mountain, through the computers to the users. The first task of the SIO is development of the architecture plan to address system requirements and establish a common baseline.

There is also a General Officer Steering Group representing the TW/AA community which will meet periodically to review new subsystem integration.

Actions taken over the past year and a half since accepting the 427M system have improved the integrity and reliability of the TW/AA system. Further, activation of the System Integration Office should be a major improvement in total system management.

CONCLUSION

My key mission as CINCNORAD is to support our country's flexible targeting strategy with unambiguous, reliable missile warning and precise attack assessment information—in a pre-, trans-, and post-attack environment. In order to perform this mission effectively, improvements documented in the TW/AA Master Plan require your support.

General DICKINSON. I will next address the priorities that must be considered in recommending various programs. The first capability that we must have is continuous connectivity during peacetime and a system that gives us low false alarm rates and unambiguous classification of any of the events which occur, like auroras, foreign and domestic missile launches for training, and others. I think that it is clear that the system must have and demonstrate that capability if it is to be believed in wartime. During wartime, the first priority capability A, is to get unambiguous warning; and for unambiguous warning in general, we would like to have warning from two types of sensors. For example, as General Hartinger has already discussed, we need both an IR satellite sensor, for example, and the radar systems, so that they are not subject to the same type of natural disturbances, and thus provide higher confidence in that warning. We require unambiguous warning to the National Command Authorities maintaining the capabilities for them to make decisions, and and to distribute their orders to the forces. One kind of unambiguous warning, certainly, is [deleted].

Now, somewhat lower in priority, but nevertheless very important, is the type of information that General Hartinger has just been discussing, [deleted] so any of the flexible strategies can be executed. We would like to get that information to the National Command Authorities [deleted].

Finally, the last but still an extremely important priority, [deleted] it is extremely important to have an enduring C³ and intelligence system so that we can use them efficiently.

PRIORITIES

Capability	Time	Environment by time period
Continuous connectivity.....	Peacetime.....	Power outages.
Low false alarm rates and immediate unambiguous determination.		Equipment and software failures, people errors, natural events (aurora), peacetime missile launches, sabotage.
A. Unambiguous warning to NCA.....	[Deleted.].....	
NCA order to forces.....		
[Deleted.]		

As I indicated before, there is another whole group of priorities, that of the time periods and therefore of the environment through which the system must endure. I think that it is clear that the first priority is not only to deal with the peacetime problems—and this includes power system upgrades that are among the programs that will be discussed—but, after the first launches, to be able to cope [deleted].

We also discussed the need to deal with the jammers [deleted].

There have been a number of vulnerability assessments. I think that you are most familiar with General Ellis' SAC connectivity study, the Navy connectivity study. There are others from the Defense Communications Agency, from NORAD, from the Defense Nuclear Agency, and our own. We recently reviewed over 24 such studies and looked at them from the entire system point of view, and according to priority, with emphasis on the unambiguous warning [deleted] and efficient peacetime functions. We have presented recommendations to the Office of the Secretary of Defense for funding, by program element.

Dr. Van Trees will discuss those programs.

Senator NUNN. May I ask one question here, because I am going to have to leave in a few minutes? I hope to get back, but I have to be downtown for another meeting.

FRAGMENTATION

I know that General Ellis, I do not know if it was at our last meeting here or whether it was out at SAC, talked about the fragmentation through this whole C³ area, connectivity area, throughout the Department of Defense.

This team that you have gotten together here certainly is an effort to begin to bring these elements together. I think that it is a start. But there are sorts of procurement decisions that are fragmented. There are all sorts of fragmentations throughout DOD.

Dr. Van Trees, how much attention are you giving to the structure within DOD for handling this overall connectivity problem?

Dr. VAN TREES. Thank you, Senator Nunn.

At the present time, there are three different elements in DOD that deal with the problem. There is my office which is responsible for basically the program structure. There is an office of the Under Secretary for Policy that deals with the C³ policy. Finally, there is General Dickinson's operation in the Joint Chiefs of Staff, which deals with requirements, acting as an interface with the Commanders-in-Chief and giving us priorities as to how we should improve the system.

I strongly feel that in the new administration there should be preserved a single focal point for the C³I system. This has to be someone who has access to the Secretary, and in an even stronger role than in the last administration, he has to have resource management control.

One of the difficulties that we have found in the strategic C³ field is that, in addition to being able to identify the things that need to be done, and we have done much better in the last several years, the studies have highlighted things that need to be done, we are then faced with the problem of getting the services to put the needed C³ programs in their budgets, because in many cases they are competing with very real service priorities.

I am then faced with the problem that C³ programs compete at the Secretary of Defense level with other priorities. Then, there is sort of a continuous problem to make sure that funds for C³ programs are not moved to support some other element. So, I think that the Secretary needs a single focal point for C³ in both policy and programs, and second, I think that whoever this person is should have access to him and have resource management control.

That focal point, coupled with inputs from the Joint Strategic Connectivity Staff, requirements definition and prioritization that General Dickinson's operation provides, would enable us to move forward much more effectively to correct the deficiencies that we have, to achieve the modernization that is necessary to deal with the increasing threat, and to support the new nuclear targeting policy, which puts very significant requirements on the C³.

That is my personal view. The new Under Secretary has just been announced. I do not know his views on this. I have expressed my views to the Secretary about this.

Senator NUNN. You already have?

Dr. VAN TREES. Yes, sir.

Senator NUNN. I hope you pursue that, because I think it is awfully important that we bring these resources and some of these decisions to some centralized area for accountability, responsibility, and authority purposes.

I know how the system works over there, and unless there is this high priority given, it is not going to happen as rapidly as necessary.

Dr. VAN TREES. Yes, sir.

I do not know if General Ellis would like to comment. I know that in previous testimony that he had indicated his view as a Commander-in-Chief that it is necessary.

Senator NUNN. General Ellis, would you like to give your personal view on this?

General ELLIS. At the DOD level, I would agree with Dr. Van Trees regarding centralization. I guess the best example that we have had in the last 10 years was when the Deputy Secretary of Defense was sort of the action officer for Command and Control. He was at a level where the decisions are made on budgets and on allocation of resources.

He was used as a vehicle to implement these decisions. I am not sure that that is the best way, but it is a way and at the proper level. Right now, I would even suggest going a step higher than Dr. Van Trees. I think that it should be as close to the top as possible.

That is because C³ does not enjoy as much support from the services because it is not a single system. It is not a tank, an aircraft, or a ship. It is something that all the services use, the Government uses, so there is going to have to be focus.

CONNECTIVITY STAFF

I would add one other thing, Senator. The new Connectivity Staff was a start in that direction. There has to be a better input from the operational commands. They are the people who have to fight the force. Those are the people who know the requirements.

We have been able to work with General Dickinson because he is our contact in OJCS, but he is limited because he does not have the resources in terms of defense dollars or program authority. All he can do is recommend. I think this is a subject that requires intensive study, and I have made my views known to the proper authorities.

Senator NUNN. Thank you, very much.

General Hartinger, do you or any of the others want to make any comments on this general area?

General HARTINGER. I would say that from NORAD's view that we have a leg up as a result of the Hart-Goldwater report, in that we now have a systems integration office in Cheyenne Mountain.

General Powers is the chief of the organization, and has the responsibility for the technical integrity of the interface design and control, the verification and test of the entire tactical warning and attack assessment system, from the sensors to the ground stations to Cheyenne Mountain through the computers to the users.

We needed something like that years ago.

Senator NUNN. Thank you.

General DICKINSON. I might just add my view that this is really a problem that has to be worked as a system. It cannot be worked piece by piece, because you can see the widespread damage caused by some of these effects that we discussed, and I think that the lack of an organization that does have the overall system responsibility, as General Ellis and Dr. Van Trees has discussed, has clearly been part of the problem in the past.

It is one reason that we feel, at least, that we are being productive with this system look even though our authority is limited, and that is one reason why we supported strongly the new Joint Strategic Connectivity Staff, again with an overall system viewpoint.

It has been compatible and very helpful to have that same sort of an organization in Dr. Van Tree's and Dr. Dinneen's organization within OSD. In general, the development, and programing and pro-

curement process throughout the Government is not designed to handle C³-system problems. It is much more designed to handle a single thing like a tank, or a gun, or an item of that nature.

Senator NUNN. Thank you.

Why do you not proceed? I just wanted to make sure that we covered that before I had to leave.

C³ RESOURCES

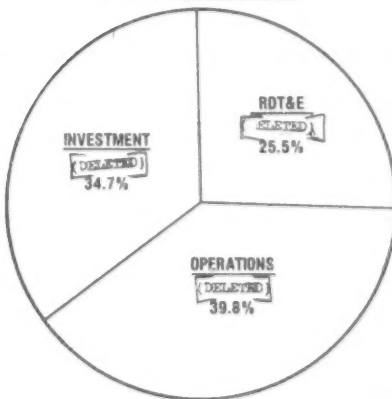
Dr. VAN TREES. Thank you, sir.

I am glad that I had the opportunity to comment. I just wanted to briefly give an overview of the C³ resources. I will first discuss resources in the Carter budget, and then later I will come back to the changes in the Reagan budget amendment.

The point of this chart [chart deleted] is that the total C³ resources we spend annually is about \$12 billion. There is about [deleted] the fiscal year 1982 budget. One of the most important areas, strategic C³, is actually only [deleted] of that. The reason for this is that in the theater and tactical area, while a radio is inexpensive, perhaps \$5,000, we may buy 200,000 of them. So, there is a much larger amount of money spent in the theater and tactical areas than in the strategic area.

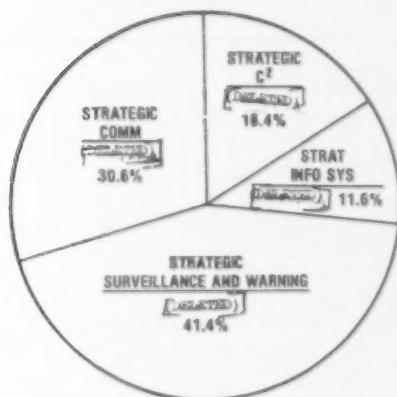
STRATEGIC C³ FY 82 BUDGET REQUEST TOA — [(DELETED)]

FY 1982
BY APPROPRIATION



(a)

FY 1982
BY MISSION AREA



(b)

In the strategic C³ area, we have this money requested in fiscal year 1982, [deleted]. You will notice that a significant amount of that is for operations, 40 percent, and it is divided among the various things, such as surveillance, warning, communications as is shown on the right side.

Another way to look at the problem is that there is about [deleted] on strategic forces in the fiscal year 1982 budget request, and about 10 percent of that money is devoted to strategic C³. This is a typical number over the years. About 10 percent of our strategic budget goes into C³, and yet, it is one of the most vital parts of that system.

Finally, the trends. What I have shown by the red line is in constant 1982 dollars. C³ resources have stayed reasonably constant over the last 5 or 6 years, in constant dollars. They have stayed as a reasonably constant percentage of the DOD budget, about 6 percent, although you will notice a gradual downward trend which is very bothersome to me. It started at about 6.3 percent and it is down to about 5.8 percent.

Percentagewise, that is not much, but that downward trend amounts to a great deal of money. Even more troubling is the trend in the outyears. This is in our projected 5-year defense program, and you will see a significant dropping off of resources for C³. In my mind, one of the major challenges in the next year's budget cycle will be to reverse this trend and get adequate funding in the outyears for strategic C³ in general.

Senator NUNN. Does anyone have a 5-year C³ plan that would show what resources are needed if you were in a vacuum and you did not have to consider any other priorities but just what C³ resources are needed now?

Do you have a personal view on that? Do you have any kind of chart that we could see?

Dr. VAN TREES. I not only have a personal view, but we have laid out what we would add to the 5-year defense program, in order of priority, to create the capability for more flexible response, and more enduring C³. We have laid this out in packages. We have these.

Senator NUNN. Do you have it for each fiscal year starting in 1981 or 1982?

Dr. VAN TREES. It starts in 1983. We have taken the fiscal year 1982 money and the amendment as a given and then looked at the outyears.

Senator NUNN. What if you had the ability to command more resources in 1982, do you have anything on that, what you would need in 1982 if this were assigned top priority in the budget?

Dr. VAN TREES. There are several items that I believe the two CINCS would probably mention. General Hartinger would like to include two new PAVE PAWS radars [deleted] and an upgrade of the existing PAVE PAWS radars. These are things that he has highlighted in his priority list which are not in the 1982 budget.

General Ellis would probably mention the acceleration of the E-4B, the airborne command post buy, and perhaps additional money for communications satellites to avoid a potential coverage gap in the future.

If I had to mention a few items, I think that these are the things that the two CINCS represented here today have expressed as high priority items.

Senator NUNN. Would you furnish for the record this 5-year plan beginning in 1983?

Dr. VAN TREES. I can give you an outline of it, yes, sir.

Senator NUNN. Is there a problem in getting more than the outline?

Dr. VAN TREES. No, sir.

I would like to give it to you in reasonably broad categories rather than getting into line item detail.

[The information follows:]

Dr. VAN TREES. First of all, let me describe what is in the Five-Year Defense Program for strategic command, control and communications (C3). In fiscal terms, that program is as follows:

[In millions of dollars, fiscal years]

	1982	1983	1984	1985	1986
R.D.T. & E.....	[Deleted]				
Investment.....					
Operations.....					

In general, the resources allocated to Operations provide for system operations and maintenance, and for military personnel needed to run the existing strategic C³ systems. The Investment account buys capabilities that have been already developed, new facilities, and equipment to replace existing systems which have become obsolescent. The RDT&E funds are used to develop new capabilities that we know we will need in the future. The RDT&E and investment funds included in the fiscal year 1982 budget requests are the result of carefully considered decisions, and reflect prioritization actions aimed at addressing our most serious deficiencies in strategic C³.

More specifically, the current program includes Investment and RDT&E funds for:

1. Improvements in Tactical Warning and Attack Assessment Capabilities.

a. Procurement of four satellites with sensor upgrades and survivability enhancements for the [deleted] satellite early warning system—including [deleted]. Mobile ground terminals [deleted].

b. Development of [deleted] to assure availability of post-detonation strike and attack assessment data in near real time to strategic decision-makers.

c. Enhancement of the Distant Early Warning Line and construction of operational OTH-B radars for airspace surveillance, to help preclude the possibility of a surprise bomber attack [deleted].

d. Upgrade of the Ballistic Missile Early Warning System, to replace obsolete equipment and improve its attack assessment capability.

2. Improvements in Strategic Communications.

a. Hardening of critical communications nodes and equipment, to protect against EMP effects of high-altitude nuclear detonations.

b. Upgrades and EMP-hardening of TACAMO aircraft for survivable communications relay to the FBM submarine force.

c. Procurement of UHF and SHF satellite communications terminals and acquisition of DSCS III and SDS communications relay spacecraft for improved connectivity to the bomber and ICBM forces.

d. Improved VLF/LF communications equipment for airborne command post aircraft, to achieve greater range and anti-jam capabilities.

e. Initial development of the multi-mission [deleted] communications satellite and terminal equipment for improved survivability, resistance to nuclear effects [deleted].

f. Development and evaluation of options for [deleted] terrestrial communications [deleted].

g. Acquisition of upgraded equipment to replace obsolete SAC digital communications capabilities, to insure availability of up-to-date status-of-forces information and rapid dissemination of force survivability and emergency action messages.

3. Improvements in Strategic Command and Control Capabilities and Facilities.

a. Acquisition of a six-aircraft fleet of EMP-hardened E-4B airborne command posts, for increased survivability and capability. This is the minimum buy needed to support, together with EC-135s, the CINCSAC and National Emergency Airborne Command Post missions.

b. Initial efforts to modernize the WWMCCS Information System.

c. Upgrades to tactical warning and attack assessment information processing systems, to accommodate inputs from more capable sensors and to facilitate reliable assimilation and dissemination of warning data.

d. Development of ground-mobile command-and-control capabilities [deleted].

e. Upgrades to fixed command-and-control facilities to reduce vulnerability of ancillary equipment [deleted].

From these highlights, it is evident that the current Five-Year Defense Program for strategic C³ addresses a wide range of capability needs and deficiencies. The funds programmed, however, do not fully resolve all of our problems and, in some instances, it may be possible to accelerate accomplishments which are already programmed, to achieve earlier corrections to existing deficiencies.

To portray the resources that could be usefully expended—in addition to those already programmed—to improve our strategic C³ posture, I will provide the requested plan in three packages. Packages IA and IB are of equal priority. IA contains resources to expand or accelerate efforts and capabilities in the current five-year program, and IB contains resources to provide new capabilities. Package II contains resources to support lower priority, but still important and needed efforts.

[In millions of dollars, fiscal years]

Resource	1983	1984	1985	1986	1987
Package:					
IA.....					
IB.....					
Subtotal.....					
II.....					
Total.....					

[Deleted.]

The programs contained in Package IA include acceleration of the E-4B airborne command post program and procurement of a seventh aircraft needed for full support of the CINCSAC and NEACP missions; acquisition of a [deleted] Mobile Ground Terminal [deleted] acceleration of the Ground Mobile Command Capability and Reconstitutable and Enduring Satellite Communications programs; development of [deleted] for increased UHF and VLF/LF communications range [deleted] for strategic aircraft; interface equipment to match computer outputs to the capabilities of Jam Resistant Secure Communications terminals; expanded research and development on survivable and enduring communications to the FBM forces, and [deleted] upgrades to the BMEWS Site III, [deleted].

The new programs contained in Package IB are not currently funded in the five-year program, and include:

1. [Deleted.]
2. Miniature VLF/LF receivers for the strategic bomber forces. This initiative will greatly expand connectivity [deleted].
3. Development and test of a prototype [deleted].
4. [Deleted.]
5. Construction of two new PAVE PAWS radars for [deleted].
6. Procurement of IONDS user terminals to provide precise, near-real-time NUDET detection data to the CINCs of nuclear capable forces, other senior military commanders, and the NCA; and of replacement sensors (in fiscal year 1987) for deployment of NAVSTAR Global Positioning System satellites.
7. Completion of development and procurement of the multi-mission satellite system space and ground segments, including EHF terminal equipment for strategic and tactical users.

If the programs in Packages IA and IB are adopted, an addition of \$329 million in FY 1982 would be appropriate; most of this addition results from the E-4B initiative.

Two major areas that have not been addressed in Packages IA and IB; (1) upgrades to strategic information processing systems and networks, and (2) C³ upgrades [deleted]. A major uncertainty in the first area is the cost of modernizing the WWMCCS Information system; as noted in the DOD report to the Congress, this program will require addition of \$600 to \$900 million to programmed resources. [Deleted] The costs of these C³ upgrade programs [deleted] hinge on a number issues which are not yet resolved, but an addition of \$500 to \$600 million to programmed resources is forecast at this time.

Package II contains resources for the following items:

1. Completion of the Ground-Based Electro-Optical Deep-Space Surveillance System (GEODSS) to provide timely tracking data in support of space surveillance and defense.
2. Upgrades to the PAVE PAWS SLBM detection radars, [deleted].
3. Investigation of the feasibility of using Over-the-Horizon Backscatter (OTH-B) radars [deleted].
4. Improvements in peripheral equipment [deleted].
5. Acquisition of means for employing [deleted] for early warning or cueing of bomber attack. [Deleted.]
6. Miniature VLF/LF receivers for strategic tanker aircraft. This initiative complements item 2 in Package 1B.

Senator NUNN. Could we get General Ellis and General Hartinger and I invite General Dickinson, too, if he would like, can we get your personal views as to this 5-year plan, and also your personal views as to what priorities you would add to the 1981 budget in the C³ area if money were available?

General ELLIS. I would be pleased to present it for the budget recognizing that it is a SAC requirement and not approved.

Senator NUNN. I understand; I am asking you personally. Can we get that from you?

General HARTINGER. Yes, sir.

Senator NUNN. General Dickinson, would you also like to give us your views on that also?

General DICKINSON. Yes, sir.

Senator NUNN. Admiral Tomb?

Admiral TOMB. Yes, sir.

[The information follows:]

General HARTINGER. Over the next five year planning period (fiscal year 82-86) I break my sensor upgrade programs into two priority groupings. Included in my top priority and currently funded in the 82-86 President's budget or the 82-86 supplemental are:

BMEWS Site I (Thule) [deleted].

BMEWS Site III (Fylingdales) [deleted].

[Deleted] Mobile Ground Terminal (MGT).

Also top priority and currently unprogrammed are:

[Deleted] PAVE PAWS.

[Deleted] PAVE PAWS.

[Deleted] PAVE PAWS.

The second priority groupings and listed in rank order are some unfunded upgrades which would improve [deleted]. They are: [Deleted].

C³ FIVE-YEAR PLAN

[The information follows:]

C³ PRIORITIES, COSTS REPRESENT FISCAL YEARS 1983-87 TOA IN \$M

Missile—X (MX) Base Comm., \$101.168M: Procures equipment and base cable plant for two MX support bases in fiscal year 1984 and fiscal year 1986, also includes comm O&M and Mil Pay.

PACCS E-4B, \$1,556.425M: Funds a seven aircraft buy and provides them with Data Automation support for enhanced force management capability.

Milsatcom, \$1,148.9M: [Deleted].

Afsatcom-Satellite continuation program, \$407.1M: [Deleted].

Advanced Space Communications, \$240.6M: Provides for development of SHF/EHF terminals, modems, and antennas for Milsatcom. Also addresses laser communications and analyzes future Milsatcom systems.

Airborne launch control system, phase III (ALCS III), \$59.615M: Enables PACCS (ALCS modified) aircraft to monitor Minuteman missile status and to reprogram missiles (200 launch facilities [deleted]).

Integrated operational nudet detection system (IONDS)/global positioning system (GPS) (space), \$1,570.591M: [Deleted].

SAC digital network (Saeidin), \$130.3M: Replaces the outdated Data Transmission Subsystem of the SAC Automated Command and Control System (SACCS), which is essential to monitoring force status.

EMP vulnerability assessment EC-135, \$48.8M: [Deleted].

Program 616A—Air Force support \$119.7M: Purchase of new MODEM's and development of high power transmitter, airborne receiver and antenna, reception processor and software [deleted] of SAC VLF/LF radio systems.

Emergency rocket communication system (ERCS) upgrade, \$24.0M: Provides spare components to replace time change items used in ERCS payload transmitters and replacement payloads used during operational testing.

Defense SHF satellite communications system (DSCS), \$1,115.1M: Provides SHF satellite communications for secure voice and high data transmission in support of worldwide military command and control. Included in this program is Jam Resistant Secure Communications (JRSC).

Accelerated LCC capability, \$181.0M: Provides Afsatcom terminals for a SHF downlink from the DSCS satellite [deleted] for all ICBM Launch Control centers.

Adaptive high frequency communication, \$106.0M: Adds features to SAC's high frequency (HF) radio system to provide improved communications [deleted]. [Deleted] replacement, \$0.4M: [Deleted].

Minuteman airborne launch control system (ALCS) phase III, \$359.51M: [Deleted.]

Standard VHF AM/FM radio for KC/EC/RC-135, \$8.4M: Installs ARC-186 VHF radios as permanent modification to the KC-135 fleet. [Deleted].

Integrated operational Nudet detection system (IONDS) enhancement, \$39.2M: [Deleted.]

Strategic Comm and alert system—SCAAS, \$23.078M: [Deleted.]

PACCS UHF Comm. improvement (improved LOS), \$57.86M: [Deleted.]

PACCS autodin (includes GEP), \$2.506M: [Deleted.]

Command center processing and display system (CCPDS) computer upgrades, \$36.9M: Funding to incorporate new expanded warning detection capabilities and to competitively replace the current equipment as mandated by the General Services Administration.

Command center processing and display system (CCPDS), communications segment (front-end-processor), \$2.5M: New warning sensor systems will interface with CCPDS. The resultant load will exceed the capability unless communications processing is separately accommodated by the proposed Front-End-Processor.

Command Center processing and display system (CCPDS) communications upgrades, \$0.17M: Will provide new terminal equipment to connect the CCPDS computer with communications lines from the sensor systems.

Command center processing and display system (CCPDS), display/control segment upgrade, \$32.1M: Funds fixes in the areas of display availability, capacity for presentation of data to battle staffs, and system growth potential.

ERCS ALTERNATE TEST BOOSTER \$8.5M: [Deleted.]

Scope Signal III (SSIII), \$15.748M: This program upgrades the Giant Talk HF radio system and provides for replacement of equipment over 20 years old.

C³ system survivability (nuclear effects), \$14.4M: [Deleted.]

Satellite system survivability (nuclear effects), \$26.6M: Provides nuclear survivability/vulnerability technology base to support design, assessment and verification of survivable satellite systems including space and ground link components.

STRATEGIC DEFENSE LIST—COSTS REPRESENT FISCAL YEAR 1983-87 TOA

Advanced warning system, \$434.2 M: [Deleted.]

Pave paws Southeast + Comm., \$162.7 M: [Deleted.]

Pave paws Southwest + Comm., \$138.3 M: [Deleted.]

Defense support program mobile ground terminal (MGT) operations, \$138.7 M: Essential support for MGTs including a Main Operating Base, support vehicles, personnel, and AFSATCOM capability.

Perimeter acquisition radar characterization system (PARCS) + Comm., \$46.4 M: [Deleted.]

[Deleted.] Upgrades, \$249.7 M: [Deleted.]

Fylingdales UHF upgrade, \$45.2 M: [Deleted.]

Pave paws attack assessment upgrade, \$70.3 M: [Deleted.]

Ground-based electro-optical deep space surveillance (GEODSS) system completion, \$32.0 M: [Deleted.]

Senator NUNN. I do not know what the others may think, but I think that this is a very, very important area. It may be that the Congress has to assign some priority here. When you get the Chief of Naval Operations saying that [deleted] until we have this area going along in a full priority sense, at least that is the essence of what he said, I think that when you have SAC and other people, involved it seems to me that it really ought to be a priority of the budget.

I gather that what you are saying is that because of the fragmentation in the Department of Defense because it is not an area that attracts a great deal of support in the Department of Defense, that it tends not to become the kind of priority that it ought to be.

Is that basically what you are saying?

Dr. VAN. TREES. That is probably a little stronger than I would put it, sir. I believe that in the last year's budget exercise that we were very effective in getting an adequate share of the budget. I was particularly pleased in the last 5 or 6 weeks during the fiscal year 1982, the Reagan amendment budget exercise, that we were able to add \$1.2 billion into the amendment in the C³ area.

I think, secondly, that the senior people in the Department, Mr. Weinberger, Mr. Carlucci, who ran the day-to-day exercise, Mr. Ikle, all gave evidence that they recognized the importance of this, and all of the items that I suggested for inclusion in the amendment were in fact included in the amendment.

So, I do not want to give the impression that we did not receive a fair share, and I was quite pleased with the 1982 budget amendment exercise in which my views were listened to at the Defense Resources Board. I think that we did well in terms of competing against other items.

Senator NUNN. General Ellis, do you think that the 1982 budget has what is needed in the C³ area?

General ELLIS. Well, from the SAC point of view, Senator Nunn, Dr. Van Trees touched on it. The E-4B, accelerated buy, is right at the top of our list, and the strategic satellite system is badly needed.

We have our list that we have added to 1982, and we have the ones that did make it.

Senator NUNN. Could you furnish that for the record?

General ELLIS. I could.

[The information follows:]

C³ PRIORITY LIST

FISCAL YEAR 1982 AMENDED BUDGET STRATEGIC OFFENSIVE C³/STRATEGIC
DEFENSIVE C³ CANDIDATES SUMMARY

Following in priority order are programs SAC considers candidates for the fiscal year 1982 Amended Budget. Funds identified are additive to the current President's Budget. They include military construction, O&M, Military Pay, and R&D funds where appropriate.

STRATEGIC OFFENSIVE C³ PROGRAM FISCAL YEAR 1982

E-4B Acceleration, \$260M.

Program accelerates acquisition of aircraft #5 and #6 and funds the 7th E-4B in fiscal year 1985 to complete the SAC Airborne Command Post fleet.

AFSATCOM continuation, \$26M.

[Deleted.] \$26M in fiscal year 1982 predicted upon fiscal 1981 supplemental of \$62.8M. If \$262.8M not added for fiscal year 1981 then fiscal year 1982 requirement is \$47.1M.

PACCS emp hardening, \$13M. Hardens 25 KC-135 aircraft.

ERCS Deployment Increase, \$3M. [Deleted.] LCC/SHF Capability, \$2M. [Deleted.]

Adaptive HF acceleration, \$7M. [Deleted.]

Command post EMP hardening, \$2M. [Deleted.]

CCPDS display/control segment Upgrade, \$13M. Expands the capability to provide timely presentation of Tactical Warning/Attack Assessment (TW/AA) information to NCA and the prime command centers.

CCPDS front end processor, \$2.5M. New warning sensor systems will interface with CCPDS. The resultant load will exceed capability unless communications processing is separately accommodated by the proposal Front-End-Processor.

DMSP II study, \$7M. [Deleted.]

Navstar/GPS enhancements, \$14.50 M. [Deleted.]

[Deleted] and cooling, \$1M. Provides power bus, air conditioning, and generator improvement essential to support upgrades [deleted]. [Deleted.] \$1M in fiscal year 1982 is based upon \$3M in fiscal year 1981, if no funds received in 1981; then 1982 requirement is \$2.6M.

DEFENSE SUPPORT PROGRAM (DSP) II \$7M. Funding allows an [Deleted.]

Southeast Pave Paws, \$71M. [Deleted.]

[Deleted] mobile ground terminal, \$32M.

[Deleted] large processing station (LPS) peripherals, \$30M. [Deleted.]

GEODSS completion, \$29M. [Deleted.]

Dr. VAN TREES. What I would like to do next, sir, is go over in my mind, the most important programs in the 1982 budget, and if you agree, I will go through them reasonable quickly, and if there is a particular program that you are interested in, I will stop and spend more time on it.

NATIONAL AIRBORNE COMMAND POST

The first is the E-4B. This serves as the National Airborne Command Post. Currently, we have one E-4B and three E-4A's. I think that it is important to spend just a moment on the distinction between these two.

One distinction is the communications capability difference between the E-4A and the E-4B. More important is the fact that the E-4B is better hardened against the various nuclear effects [deleted].

So, a high priority item is converting the E-4A's to E-4B's. Now, thta conversion program is funded in the fiscal 1982 budget, and it is moving at as rapid a pace as possible.

Also included in the 5-year defense program is the buy of the fifth and sixth E-4B airborne command posts.

The next program is the [deleted] satellite program. As was discussed earlier, this is the satellite [deleted] detects SLBM and ICBM launches.

There is money in this year's budget to upgrade this satellite system. In subsequent years, we are going to buy four new satellites which will have improved sensors, [deleted] and will be significantly more survivable. So, this upgrade greatly improves our capability.

It will give us [deleted] more survivability, and the cross links will reduce our dependence on the ground station [deleted].

Coupled with the satellite upgrade is our program for mobile ground terminals. Right now, our system is vulnerable because the information from these satellites comes down to the fixed ground stations, [deleted].

Our mobile ground terminals will be able to move around in a random manner, and will be very difficult to target. This will give us a survivable ground facility to receive and process the information, [deleted]. We think that this is a very important program.

Senator NUNN. Can you move those around at periodic intervals in peacetime?

Dr. VAN TREES. Yes, sir.

Senator NUNN. So, they will be rotating all the time and it would be hard for them to know where they are at any one time?

Dr. VAN TREES. The operational concept that CINCNORAD has developed includes this, so they will not be able to accurately target the capability with high confidence.

Senator NUNN. I think that this is an extremely important area. It is a little bit of a paradox to me as to how we are worried so much about the antisatellite capability of the Soviets. You read about it all the time that all they need to do is get a Piper Club, two people, and a couple of hand grenades and knock out the ground station.

That is still the case today, is it not? I know it is in [deleted] because I just came back from there.

Dr. VAN TREES. There is certainly [deleted]. We think that this is a high-priority program. We had difficulty with the Congress last year. We requested [deleted] and only [deleted] were approved.

We have added money back into the amendment to try to accelerate the program. We want to move to a total of [deleted] of these as quickly as possible.

Senator NUNN. About 4 years ago, my impression was that the ground stations could have been knocked out by one person with a 22 rifle. I think that the security has been improved to the extent it would take [deleted].

If Congress funds what you have requested within the present Reagan 5-year plan, when would you have these operational?

Dr. VAN TREES. I believe that the IOC of the first [deleted] is [deleted] I will check that item.

Senator NUNN. Fiscal year [deleted].

Dr. VAN TREES. Yes, sir.

INTEGRATED OPERATIONAL NUDETS DEFENSE SYSTEM

Now, the next program is something that provides a capability for detecting nuclear detonations, the Integrated Operational, Nudets Detection System. This plays an important role [deleted].

The system provides accurate location of the burst and the yield. Now, the actual program is carried [deleted] through this process.

The reason that I bring it up is these detectors ride piggyback on another satellite system called the NAVSTAR global positioning system. This system is very important for the position-fixing and navigation function it provides. But so often when people discuss it, they forget that in addition to that navigation role, it will carry the [deleted] nuclear detection system [deleted]. The global positioning system program has been somewhat controversial. We think that it is very important for its strategic role because it carries this nuclear detection device.

Now, I would like to shift to our programs for communications to the forces. The TACAMO is the airplane that is airborne over the Atlantic. It receives messages [deleted] and then relays them to the submarines. The current budget calls for hardening these aircraft and procuring several more.

These aircraft are old. [Deleted.]

The next system I will discuss is the extremely low frequency communications system. This is something that the committee has heard about over a number of years.

Senator NUNN. On the requests we have made for the record, we are on a very fast track this year trying to mark up this bill so we need to get these observations for the record just as rapidly as possible.

Dr. VAN TREES. Yes, sir.

Senator NUNN. I think that we are going to try and finish marking up the bill in early April, so time is of essence.

Thank you, very much.

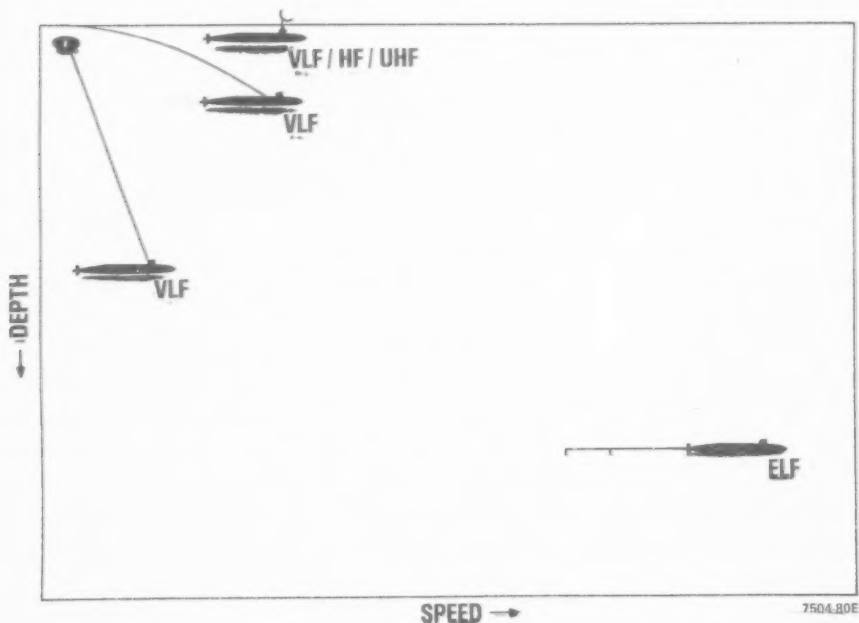
Dr. VAN TREES. Thank you, sir.

Senator WARNER. Please proceed.

Mr. VAN TREES. I was just beginning my discussion of the extremely low frequency system, which I am sure that you are familiar with. As a bit of background, our current systems require that the submarine either be near the surface and have an antenna that is physically attached to the submarine out of the water, or that he have a trailing-wire antenna or an antenna buoy close to the surface.

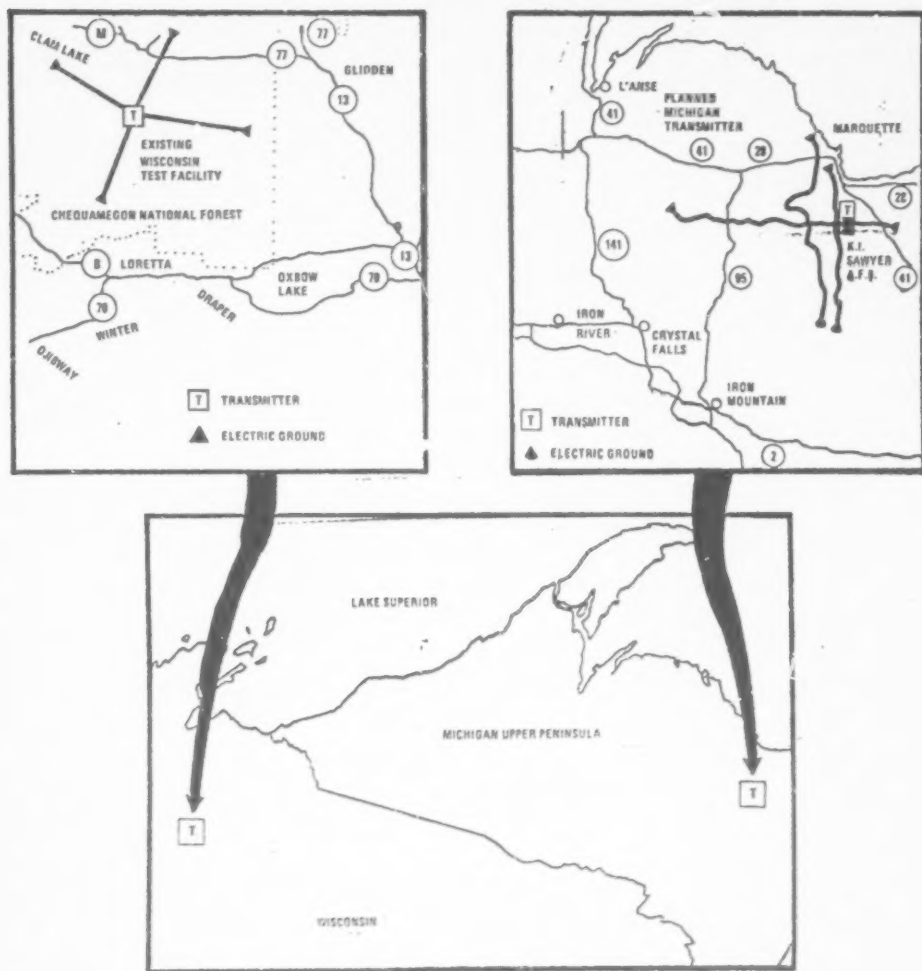
Now, this obviously creates operational constraints on the submarines, and we would like to remove these.

RADIO ANTENNA LIMITATIONS ON SUBMARINE SPEED AND DEPTH



In the bottom righthand corner, the chart shows with an extremely low frequency system, the submarine will be able to operate at its design depth and speed and still be able to receive messages.

PROPOSED LOCATION OF THE 2-SITE ELF COMMUNICATION SYSTEM



The system that is being considered would be located in Wisconsin and Michigan. It consists of the existing 28-mile configuration in Wisconsin and a 130-mile configuration in Michigan. The Michigan transmitter would be at the K. I. Sawyer Air Force Base and the actual antenna lines are buried in the ground about 6 feet deep. They are buried with a trenching machine that would go along public roads in the Michigan area.

Last year, the Congress directed that the President make a decision on the deployment of this system by April 1. We anticipate that the Secretary of Defense will make a recommendation to him shortly.

Next, I would like to talk about the satellite communications area. This was highlighted earlier as one of the things that we need to improve our communication to the bombers, the ICBM's, and to the submarines. Now, this chart is reasonably complex. I would like to

spend just a minute on it because it is important to understand how the whole satellite system fits together. [Chart deleted.]

FLEET SATELLITE COMMUNICATIONS

We have four kinds of communication satellites in the Defense Department. In the top row, I have indicated a set of users: The CINC's, the submarines, the bombers, and ICBM launch sites. Today they communicate over a set of satellites called FLEETSAT, for fleet satellite communications.

These are satellites at geosynchronous orbit, and they communicate at the ultrahigh frequency, UHF. [Deleted.]

Another thing that is important to remember, which we did not show on a chart, is that [deleted]. So, UHF is susceptible to jamming and nuclear effects.

The follow-on to the FLEETSAT as currently envisioned will be a set of leased satellites, still using the UHF band. So, that blue band represents a particular type of service which is reliable in peacetime, [deleted].

The third box is for the Defense Satellite Communications System, which provides our standard long-haul service. It is at a higher frequency band, [deleted]. The new DSCS III satellites, the first one of which will be launched in July of this year, also have significant anti-jam capability. So, it is a very effective system against jamming [deleted]. This is a program that is currently on schedule. It is adequately funded, and we think that it will be a significant improvement in our capability.

I would like to spend some time on the last row, because it describes the new satellite program that we will be advocating after a little more concept definition. The money for this program in this year's budget is actually quite small, but it will be a major item in the fiscal 1983 budget.

It provides, we think, the capabilities that are needed in order to guarantee the connectivity that General Ellis, and General Dickinson and Admiral Tomb have talked about. Some of the important things to notice are that it is at [deleted].

So, this is a much more capable satellite, and we think that it will be a significant increase in our connectivity. I have shown some of its characteristics on the next chart [chart deleted].

[Deleted.]

Now, this is really the first program that I have talked about that is a new initiative that is first arising in the fiscal 1982 budget. The money this year is not large, but I think that it is important that we do an effective job of explaining the program to you and to the other committees, because over the last 3 years, the strategic satellite program has been turned down by Congress. This has really created a gap [deleted].

Now, we have restructured the program. We have concurrence from the various services that this looks like a logical approach. We think that it is an effective way to solve the problem, and we still look forward in later years to [deleted]. So, we think that this is a very important program and hope that the committee will support it.

Senator WARNER. Let me interrupt, because there is a concern that I have, and I think that it is shared by other members of the committee

and committee staff, and that is the vulnerability of any satellite system to the ground-based laser.

Will you be covering that?

Dr. VAN TREES. I was not going to, but I will be happy to.

Our assessment of the ground-based laser threat is that for a [deleted].

So, that is the first point. [Deleted.]

Senator WARNER. Thank you.

Dr. VAN TREES. Now, these are the sets of programs that I plan to cover. In the last 2 years, there have been three important Presidential directives. Perhaps there have been many important Presidential directives, but three in particular affect the C³ field.

PRESIDENTIAL DIRECTIVE NO. 53, (NATIONAL TELECOMMUNICATIONS POLICY)

In support of national security policy, the Nation's telecommunications must provide for: Connectivity between the National Command Authority, Strategic Forces, and other appropriate forces to support the flexible execution of retaliatory strikes during and after an enemy's nuclear attack.

The first is Presidential Directive 53, on national telecommunications policy.

Senator WARNER. I do not see a classification on that. It that purposely omitted?

Dr. VAN TREES. No, sir, it is an unclassified directive.

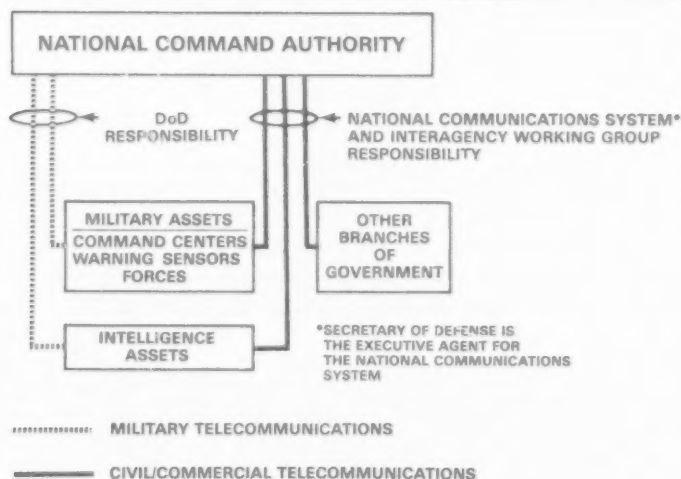
Senator WARNER. I just wanted to make it clear.

Dr. VAN TREES. The entire directive, not just this quote, is unclassified.

A key paragraph in there says that "the Nation's telecommunications has to provide for connectivity between the NCA, the strategic forces, and other appropriate forces to support flexible execution of retaliatory strikes during and after an enemy's nuclear attack."

If the community could comply with this paragraph, we are in essence solving the connectivity problem that General Ellis alluded to. So, the implementation of this directive is very important in the context of strategic connectivity that we have talked about.

DoD/NCS RELATIONSHIPS



I think that sometimes people forget that paragraph and what it includes in terms of systems, and I have tried to construct a reasonably simple chart here. In the middle, I have shown the military assets, the command centers, the warning sensors, the forces, intelligence assets.

These are the things that we have that we want to communicate between. Now, some of that communication traffic is carried over military systems. The TACAMO is a military aircraft. The Defense Satellite Communication System uses a military satellite. For those things, we think that it is DOD's unique responsibility to provide the CINCS and NCA their connectivity.

So, there is one part of this problem, a major part of the problem that is a unique DOD responsibility. Then, on the other side, the red lines indicate that there is a great deal of the traffic that is carried over commercial service, the A.T. & T. system and other commercial telephone systems throughout the United States.

As of right now, almost all of this is provided by either ground-based lines, in other words, microwave links or cables, or commercial communication satellites. It is this part that much of the work under the label PD-53 has focused on. The National Communications System and an interagency working group has set out to try and make this part—the commercially supplied part of it—much more survivable. At the same time, we in DOD are working on the military assets, to make them more survivable.

Some of the initiatives and some of the accomplishments under PD-53 are shown on the next slide.

For the near term, we are looking at reducing the EMP vulnerability [deleted].

Common-carrier interconnection is important in that now we have under the new regulatory atmosphere not only A.T. & T. but a number of specialized carriers providing commercial service. On a normal day-to-day basis, there is no particular reason that they should be interconnected, but we would like to have the ability, if we have to reconstitute commercial communications, to connect for example the MCI system to the Bell system in order to restore connectivity in the trans-attack and post attack era.

PD-53 mid-term technical initiatives

Planning:	Costs
Critical circuit decentralization.....	Low.
Multiplex equipment survivability improvement.....	Do.
Decentralization of management/control functions.....	Low-med.
Mobile/transportable connectivity reconstitution.....	Low-med.
Common carrier interconnect/interoperability for improved survivability	Med-high.
National emergency power program.....	High.
Survivable satellite program.....	Do.
Implementation: National EMP protection program.....	Do.

NOTE.—Low=\$1-10M; Med.=\$10-100M; High>\$100M.

So, these are dollar values for near term. For the intermediate term, we have a set of initiatives. These are not yet completely costed, but they include such things as having mobile units that you can pull up outside of a damaged switching center and connect through to another switching center.

We are looking at initiatives to provide emergency power for communications and system, EMP protection. Some of these will require a great deal of money. We are not yet at the stage of requesting them in this year's budget, [deleted] more survivable and reconstitutable. We think that it is a very important initiative.

The second Presidential directive is Presidential Directive 58. This particular directive deals with [deleted].

So far, we have set up a joint program office to work on this problem. We have an interagency steering group, and we have developed some initial plans. [Deleted.]

The third Presidential directive is Presidential Directive 59. This was referred to several months ago in the newspapers as the new targeting policy, it is actually an evolutionary policy. I do not want to particularly get into the targeting aspects, but I want to discuss the implications with respect to strategic C³.

One of the questions that is asked is what is the matter with C³? Part of the answer is that the threat is increasing, and we discussed that earlier. The other part of the answer was alluded to earlier by General Ellis, and that is the [deleted].

[Deleted.] Now, we have to be able to offer the NCA the information that he needs in order to have flexible response.

We need to have endurance [deleted]. There are a whole set of things that very impact our strategic system. These are things where the requirements have changed, and we are trying to shift the emphasis in our C³ program in the strategic area to meet them.

One of the programs that is trying to accomplish this is called the Enduring C³ Program. Under this program, we are looking at new initiatives to provide endurance. [Deleted.]

The difference is that to get enduring C³, I might be able to reconstitute things where as for surviving C³, I need something that is continuous. Under the enduring C³ program, we are looking at [deleted].

This is a program that is structured and is really looking at how we can respond to the new requirements of PD 59. This is basically all I wanted to cover under programs and Presidential directives. I have just one chart on the Reagan budget amendment.

Defense Budget Amendment

Command centers-----	[Deleted].
Surveillance and warning-----	Do.
Communications-----	Do.
Information systems-----	Do.
Strategic command, control, and communications-----	Do.

There are now increments to the Carter budget. In fiscal 1982, [deleted] million was added in the strategic area. As I pointed out earlier, about [deleted] was added to the overall C³ program. While you were out, Senator Nunn asked about the priorities, and I would just like to repeat that I felt that in the budget amendment exercise, that C³ was treated very fairly, that both the Secretary and the Deputy Secretary listened to our priorities, understood the importance of them, and we feel that we got a very fair share.

Senator WARNER. I was going to ask the same question, and I was advised by staff that each of the witnesses have addressed that question

or will for the record. Perhaps at the close of the hearing, I will invite each witness to make some oral statement and then to the extent that they desire supplement it later because I would like to hear that.

Dr. VAN TREES. All right, sir, fine.

Senator WARNER. I might say that I am quite optimistic that we will be able to get the level of funding requested by President Reagan and that the record that we are putting together today will certainly substantiate it, and my difficulty, if there is a difficulty, will be in conveying limited facts to my colleagues not on this committee in the hopes that they will accept the creditability of the committee as a whole, and of the subcommittee and of this particular Senator as I very forcibly advocate the need for these funds.

Dr. VAN TREES. Thank you, sir.

Now, I would like to touch on two special topics. First, NORAD improvements since the false alert in June, and second, some comments on the report by Senators Hart and Goldwater.

NORAD IMPROVEMENTS SINCE JUNE 1980 INCIDENTS

TECHNICAL IMPROVEMENTS

- IMMEDIATE — OPERATIONAL SINCE SEP 1980
 - COMMUNICATIONS DATA MONITORS
 - END-TO-END COMMUNICATIONS VALIDITY CHECK
 - OFF SITE TEST FACILITY
- NEAR TERM
 - UPGRADE MESSAGE PROCESSOR
 - DEVELOP MISSILE WARNING BYPASS
 - IMPLEMENT FAILOVER PROCESS OF NORAD COMPUTER

ORGANIZATIONAL IMPROVEMENTS

- SYSTEM INTEGRATION OFFICE — IMPLEMENTED 1 JANUARY 1981
 - FOR ENTIRE TW/AA SYSTEM (SENSORS TO USERS)
 - OVERALL MANAGEMENT
 - END TO-END TECHNICAL INTEGRITY
 - CONFIGURATION CONTROL

IMPACT

ESSENTIALLY
ELIMINATES MESSAGE
ERRORS

IMPROVES SYSTEM
RELIABILITY

SINGLE END-TO-END SYSTEM
MANAGER

As you know, we have made extensive improvements in both operational and technical procedures as a result of the June, 1980 incidents. I would like to discuss first some of the technical improvements.

First, these are things that have been operational since September. Without getting into the details, basically what we have done is put in codes which detect and correct errors in messages. These are things in which you have a message coming along, and you simply add some checks on the end of it, so when it gets to the other end, if the receiver cannot go through these checks and see that there were no errors, it rejects the message.

We now have an error detection system that essentially eliminates the possibility of an erroneous message getting through the system. This has been in operation, this particular capability, since October. In no sense has this changed the fact that we have humans in complete

control of the system. We think that this is a very important step forward.

We have also brought online an offsite test facility. This is a facility that is in downtown Colorado Springs outside of the mountain, and the reason for this is so that we do not have to use the computers in the mountain, which are performing an operational role, to perform testing and program improvement. So, we think that this is also an important step.

This offsite test facility was brought online in a very accelerated manner. One of the reasons for this was that because of its importance, we got a delegated procurement authority and were able to require the computers that were needed in a much more expeditious manner.

In the near term, these are things that are being worked on right now. We are upgrading some of the equipment. We are developing bypasses. All these things will improve the system reliability.

Finally, in terms of organizational improvements, as a result of an extensive Air Force study, the Air Force organized a system integration office starting on January 1. General Powers from NORAD is the head of this office. It is starting to be staffed now.

It is going to have the responsibility for the entire TW/AA, tactical warning and attack assessment system, the overall configuration of this system, and its technical integrity. One of the problems that we saw when we looked at the NORAD incidents was that nobody had responsibility for the system from the sensor all the way through to the person who was looking at the data.

We have now established this under CINCNORAD and with General Powers personally in charge of it, and we think that this will be very important from the standpoint of identifying problems, showing what improvements need to be made, and in general keeping the system under close surveillance.

Review of Goldwater-Hart report on missile attack warning system

Major concern	Actions taken	Results to date
Operational procedures and support provided.	Extensive Air Force study (report provided to SASC on 15 Dec. 1980).	57 recommendations being implemented including system integration office (SIO) for end-to-end integrity.
Organization/management.	Cost/benefit analysis of consolidation.	Reorganization begun in 1979 to be fully completed in April 1981. System functioning effectively now, no compelling need to reorganize. SIO to provide end-to-end technical integrity to be fully staffed by 1 October 1981. Recommend review in 1 year to assess impact of SIO.
ADP procurement.	Discussions with GSA and review of acquisition of acquisition examples.	Continuing discussions to identify critical systems for possible general delegated procurement authority.

The other special topic that I wanted to look at was the Hart-Goldwater report. We have been asked to comment on it, and our official response will be back later this month, but I wanted to deal with three concerns that they expressed, and what we are doing about it.

First, they talked about operating procedures and support provided. An extensive Air Force study headed by General Leaf, the Air Force Inspector General, was conducted with participation by all of the interested commands and the Air Staff. This report was provided to your committee on December 15. There were a number of recommendations that are being implemented.

The second area was organization and management. The recommendation was to look at the organization and to see if we should have a single person in charge of both resource management and operational control. We did a cost-benefit analysis of consolidating that.

The conclusion that we are reaching is that a reorganization was begun in 1979 and will not be completed until April of 1981, and we feel that the system is functioning now, and we do not feel that there is any need to reorganize away from the current organization structure. We feel that the system integration office will be a great aid in end-to-end integrity, so our recommendation coming back to the committee will be that we look at the organization as it finalizes, that we look at how well the system integration office does, and then report back to you a year from now on what progress that we think that we have made.

The third area dealt with ADP procurement. This dealt with the fact that many times the procurement regulations and various rules were slowing down our ability to bring in new ADP equipment. We have looked at this recommendation, and we are carrying on discussions with the General Services Administration.

We are looking at ways to get delegated procurement authority. We are not yet ready to give you the final answer on this. I know that the new Under Secretary for R. & E. has labeled improved acquisition in general as one of his highest priority topics.

As soon as he is onboard, I plan to discuss this area with him, and I would think within the next 2 or 3 months that we would have a more definitive recommendation in this area.

These are the two special topics that I wanted to cover. We would be happy, both I and the other witnesses to answer any questions that you have, sir.

Senator WARNER. Well, the first question that I would like to ask, even though it might be slightly repetitious, is to go back over with each witness their personal opinions with respect to this funding level and the new direction that the President is taking, the adequacy and the like.

Perhaps, Mr. Secretary, you have stated your views, and we will just go left to right with General Dickinson first.

General DICKINSON. Yes, sir.

The additions that have come forward, the basic budget plus the supplement for 1981 plus the amendment have been really very responsive to the prioritizations that we have given. Clearly, there are additional things that could benefit from additional funds.

I think that General Ellis' and General Hartinger's priorities show that there are things missing that have been discussed, but I prefer them to discuss those particularly. We are also continuing to fund

system problems. In some cases, we were not fully ready with budget quality proposals at the time of those amendments.

We are almost sure that within a reasonable short period of time that there will be additional things that we can define, and in most of those cases we have at least part of the amount that is needed in either the 1981 or 1982 years and we can get started on work. [Deleted.]

I suspect that more will be needed. We are defining precisely how much that will be now. There are additional programs such [deleted] the TACAMO aircraft for the Navy. We certainly support the additional acceleration, if possible, of the ELF program, the extreme low frequency program, once there is a Presidential decision on that matter. That we are waiting for.

It may be possible that we could accelerate [deleted] I expect that we will continue to define those. We are trying to define those and bring forward specific recommendations for funding. We did recommend, as has been mentioned earlier, the additional moneys as insurance against a potential satellite service gap [deleted.]

We think that that as good insurance money should be funded, and we support the others that will be talked about by General Ellis and General Hartinger, I believe.

Senator WARNER. General Ellis, before you respond, let me amplify the question. We are looking at authorizations of dollars for a series of improvements, primarily improvements to be achieved by new equipment. Nevertheless, this tactical framework overlays a set of procedures involved in the Presidential memorandum.

I would like your opinion, to the extent that you can give it for the record, and if you wish to see me privately due to a classification problem or otherwise, I would hope that you would do so, as to whether there are revisions in these procedures that you feel are important, and whether or not even though we get the tactical framework, is that framework technology superimposed on a basic set of procedures that in and of themselves may be faulty.

Did I make myself clear on that?

General ELLIS. You did, Mr. Chairman.

PRESIDENTIAL DIRECTIVE

With regard to the procedures that relate to national policy, the best reference that I can make would be to the latest Presidential directive on how we do our targeting. I think that the intent—

Senator WARNER. What is the timeframe of that Presidential directive, the Carter directive?

General ELLIS. It is PD-59, released early last fall.

The intent that I think is desirable is an extension of the so-called Schlesinger document, National Security Decision Memorandum 242, signed by President Nixon in January 1974.

Within those documents and the implementing documents from the Secretary of Defense [deleted]. In the guidance that comes to us in terms of directives for the composition of our nuclear war plans, we would recommend that [deleted] our C³ capability.

The doctrine requires knowledge on the part of the other side of what our intent is when we initiate a certain option. If he is unable to understand the intent, then in my opinion [deleted].

On the other side of the coin, some of the options require enduring and survivable control. They require attack assessments and judgments [deleted]. That was recognized in the guidance. I am sure that the new administration is going to look at the guidance both at the highest level to include DOD level. The instructions that come down to us, I am sure, will reflect what I have just described.

Senator WARNER. But therein rests my concern, and that is that this new administration has had insufficient time within which to make an assessment of the prior Presidential directives and to incorporate whatever amendments that they may deem desirable.

Now, in view of that, would we be proceeding through this authorization to authorize equipment and systems that could later prove inconsistent with the revision by President Reagan?

General ELLIS. Assuming that the general thrust of the directive remains the same, that is to provide the President additional flexibility in the decisionmaking process rather than limiting him [deleted] the items that are in this budget are not inconsistent with those directives.

If this administration changes course completely, we would first have to see the direction that they would be taking. I could not make a judgment on that, Mr. Chairman.

Senator WARNER. Would you advise the chairman then to initiate within the administration a very prompt assessment of the existing directives and urge them to make whatever amendments that they want before you proceed?

General ELLIS. I talked to Mr. Ikle, the Under Secretary for Policy designate, yesterday, Mr. Chairman, and I brought this point up. I would hope that early on his agenda is a review of these directives, and he said that was their intent.

Senator WARNER. Mr. Secretary, the same questions to you. Would you acquaint Secretary Ikle with my questions. I would like to hear from him at the earliest opportunity.

Dr. VAN TREES. All right, sir, fine.

Senator WARNER. Do you have any response to my questions? Now, you know we are proceeding to a markup possibly as early as the first of April or even sooner, and I want to do a minimum of backfilling.

Dr. VAN TREES. Yes, sir.

As General Ellis says, should there be a complete change of direction, then we would have to reassess, but if one looks at the general content of Presidential Directive 59, that it is something that has evolved really over a period of 7 or 8 years through several administrations, and I would predict if I had to that there might be minor modifications to it, but certainly the general thrust requiring an enduring capability for the NCA and flexibility in his response would be retained. I am reasonably confident that that will be the central theme of that directive.

I know that Mr. Carlucci in his confirmation testimony in essence reaffirmed parts of it without calling it Presidential Directive 59, and in discussions that Mr. Ikle participated in he in essence reaffirmed parts of it when we were dealing with items that were related to flexibility and endurance. I know that the NSC staff apparently are reviewing all of the directives on an expedited basis.

I will convey your wishes to Mr. Ikle.

Senator WARNER. Particularly the time frame in which this committee is going to operate.

General Dickinson, did you have anything to add to the second question before we proceed?

General DICKINSON. Mr. Chairman, as you noted in my discussion of priorities, we certainly put the first priority on the capacity to get unambiguous warnings in and confidence in getting the orders back out after an NCA decision during the earliest time period, [deleted].

Senator WARNER. Have you completed, Mr. Secretary?

Dr. VAN TREES. Yes.

Senator WARNER. General Hartinger, two questions: A, funding level, and B, the consistency between the existing memorandum; directives, and what we presumably are going to embark on, whether there is sufficient flexibility in this new program to accommodate the foreseeable revisions that might be inaugurated by the new administration.

General HARTINGER. Mr. Chairman, I will address the second question first.

Presidential Directive 59 did not affect NORAD's mission in that we already had in our charter the requirement to provide attack assessment information and to do that as well as possible. So, from our view, the directive formalized what had been in our charter for years. So, in that respect, it did not affect our mission.

We already had the obligation to provide that type of information to the President. Of the improvements I covered in my presentation, I feel the top five should be in the 1982 amendment. We understand that two are in the 1982 amendment, and the other three of the top five, I feel, should be.

PAVE PAWS SITES

These are the upgrades to upgrade the two PAVE PAWS sites [deleted] and construction of the PAVE PAWS sites [deleted].

Senator WARNER. Do you not have the amendment yourself? You say that you understand that it is in the amendment. Have you not seen the amendment?

General HARTINGER. Well, sir, it is changing.

Senator WARNER. Well, I appreciate the problem. I do not mean to pin you down at all.

Mr. Secretary, you are about to address that?

Dr. VAN TREES. Yes, sir.

The final budget amendment was held reasonably close until before yesterday, when it was presented to the Congress by the Secretary.

Senator WARNER. I understand that.

Dr. VAN TREES. General Hartinger does have access to it now, and his information is correct. [Deleted.]

General HARTINGER. I am sure that my staff has it in Colorado Springs, sir, but we have been in transit for the last day or two.

General HARTINGER. Anyway, sir, of the five items, there are two that are in the amendment; that is, to update the Fylingdales in England, and a fifth mobile ground terminal that you were briefed on by the Secretary. [Deleted.]

Senator WARNER. Would you ask Secretary Ikle to examine the General's representation to the committee with respect to the additional add-on that he recommends?

Dr. VAN TREES. Yes.

Senator WARNER. Admiral Tomb?

Admiral TOMB. I have nothing to add to General Ellis' submitted statement recommending some of the near-term improvements that we feel are necessary. I would let it stand on that.

General ELLIS. May I insert one thing?

Senator WARNER. Yes, indeed.

General ELLIS. Mr. Chairman, while you were out, Senator Nunn asked us specifically if we would provide the SAC requirements, the command requirements, that were not met in the 1981-82 add-on. I told him that we would because we do have some items that have not been funded.

Senator WARNER. I recognize the shortness of time in which you have had an opportunity to look at this. I recognize also the complexity of traveling back and forth and the unavailability of this information.

General Hartinger, the GAO is now conducting a review of NORAD management and procurement practices.

What can you tell us about that view?

General HARTINGER. It has been ongoing for a few weeks. I understand that they are supposed to have a report back by the end of April. From the indications that I have, it is an objective audit of our procedures and our management.

Senator WARNER. All right.

Now, Dr. Van Trees, could you compare blue-green laser communications with the ELF system, citing the advantages and the disadvantages?

Dr. VAN TREES. I would be happy to, Mr. Chairman.

Senator WARNER. You may give a brief précis, and then supplement it for the record, but it is very important that we get it into the record.

Dr. VAN TREES. All right, sir, fine.

I have one chart that helps address this, and I have a representative from the Advanced Research Projects Agency to answer any more detailed questions.

[Chart deleted.]

Let me just show you one chart. On the left side is the ELF system. Basically, in terms of what does it do, it covers a large area but at a very low data rate. You can send out very short messages. Therefore, they do not contain much information. It covers this entire area simultaneously. Its advantage is that it is really water and weather independent. It does not make any difference if it is raining over the ocean, or if there is cloud cover. The essential communications capacity stays the same.

BLUE-GREEN LASER PROGRAM

Now, the blue-green laser program, one configuration of it is shown on the right side. This particular one uses a laser in the satellite, and it illuminates a small area in the ocean. While it is illuminating that

area it can send down information at a high data rate. It is a much higher data rate than we get at ELF, but to talk to different submarines, we must move the beam around.

So, it is a spot system. The spot would move around and communicate to the various subs [deleted].

Those are really the basic difference in ideas. One is higher data rate. It has limitations due to bad water, clouds, and so on. We think that the blue-green laser program is a very important technology effort. There is going to be a significant milestone this summer, when we demonstrate communications between an airplane and a submarine.

We think that it is a capability that could play an important role in the post-1990 time frame. We do not feel that it is a competitor to the extremely low frequency communications system for two reasons. One, the extremely low frequency communications system is something that we can achieve by [deleted.] and it provides an important capability. Two, there is a significant difference in the cost of the two systems.

So, the current position is that we would pursue blue-green lasers in an aggressive technology program, and look and see what we can accomplish, and then make decisions as to whether it represents a good idea for an operational system.

If there are more detailed questions, as I say, I have a representative from ARPA to answer them or we can provide more comparisons for the record, if you wish.

Senator WARNER. Perhaps Dr. Tanimoto could comment on the status of the blue-green program.

STATEMENT OF DOUGLAS TANIMOTO, ENERGY OFFICE, ADVANCED RESEARCH PROJECTS AGENCY

Dr. TANIMOTO. In the last year, we have addressed the serious issue of communicating through clouds to a receiver on the ground. In this important experiment, we took a pulse-position-modulated laser at an altitude of 40,000 feet and communicated with a receiver through clouds over Mount Waialeale, Kauai, in the Hawaiian Islands. This experiment was conducted through 9,000 feet of clouds.

The serious issue here has to do with the effects of scattering and multiple reflections through the clouds. Another serious issue has to do with propagation through water. We have some very good data comparing satellite-collected information with the absorption and attenuation, of water through some measurements made from a ship. The agreement of these two approaches in characterizing water conditions was better than 95 percent.

Also in the last year, there has been some significant progress in the laser device itself. There are two approaches as discussed by Dr. Van Trees. One has to do with putting a laser on a satellite. The second has to do with putting a laser on the ground. This ground-based laser is not of the high-energy weapons level but only need be of the order of tens of kilowatts.

In the second approach, we illuminate a reflector in space, which would then spread this beam over several milliradians, that is, of the

order of a fraction of a degree, over the ocean's surface. So, this is not a very tightly collimated beam and would instantaneously illuminate an area on the order of several hundred to a hundred thousand square miles. Then scanning with this mirror in space, allows a very large areal coverage.

This would allow us to cover the [deleted]. We feel that the key issue there has to do with being able to deliver this energy from the ground to the reflector at geosynchronous orbit. [Deleted.] For the ground-based approach, the laser and transmitter could be mounted in an aircraft to enhance survivability.

In the last year, we have been able to demonstrate that we can compensate for the deleterious effects of the atmosphere. As the beam propagates through the atmosphere, there is a degrading effect, break-up of the beam, caused by the atmosphere. Recently at Lincoln Laboratories, we were able to show that you can preserve beam quality by correcting for the effects of the atmosphere. That was, in fact, done in the last couple of months. It was a closed-loop laboratory experiment. We will continue with long-range experiments in Hawaii—in the future. There, we have an optical station where we can track satellites. In addition to that, we are examining the technology to correct atmospheric effects for image enhancements. This work is being done in support of the high-energy laser weapon work as well as to demonstrate that we can propagate a high-quality laser beam from the ground station to a satellite in space.

With respect to the reliability of lasers, there is a very serious deficiency at this time, respect to putting the laser in space. It has to do with the laser lifetime, and achieving operational reliability over 3 to 5 years. We would like to get on the order of 10^{10} to 10^{12} shots over that time in order to maintain connectivity like 95 percent of the time.

In that regard, we have had some very promising breakthroughs recently in generating suitable laser wavelengths that are necessary for good seawater penetration. So, I think that we are quite pleased with the progress. A very important experiment that Dr. Van Trees alluded to is the aircraft-to-submarine experiment that will take place in May.

For the experiment, we will use the [deleted]. In 1983, we would like to do this experiment under very adverse conditions, [deleted] with very bad water and bad cloud conditions.

So, that is our present plan.

Senator WARNER. Thank you.

SATELLITE SERVICE GAP

General Dickinson, I think that you mentioned a satellite service gap.

Why do you think that such a gap may develop? What are the insurance funds associated with our efforts to hedge our bets in regard to the gap and what options exist on which such funds could be expended to bridge this gap?

General DICKINSON. I think that I would like to pass that particular question to Dr. Van Trees. He has made the recent assessment of the probability of that gap. The service recommendations have been

that it is really a matter of how highly we assess the risk and it is being restudied at this time to determine whether the additional funding is warranted within the 1982 program.

Dr. VAN TREES. Thank you, Senator.

The basic issue is, and perhaps it would help if you put up the satellite chart, [chart deleted] a key part of our connectivity now is the FLEETSATCOM program, and following it, the LEASAT satellites. The FLEETSATCOM satellites will begin to reach the end of their design life in about [deleted].

Now, one of the problems in this business is that you have a certain design life for the satellite and you never know ahead of time whether they are going to last less than that life or longer than that life, but we use statistics to try and predict what the gap will be.

So, in about [deleted] we will start losing FLEETSAT's. We have bought five of them. Four are on orbit and working well, and the fifth will be launched this summer. So, the first issue is how long will the first four last and whether the fifth launch be successful and result in a working satellite.

The second part of the system is the satellite data system and it contains packages on it that provide the same capability. So, the question is in this [deleted] time frame, will the combination of the satellite data system and the remaining FLEETSAT satellites have adequate capacity and coverage to meet the CINC's requirements.

Now, we have not yet completed an adequate analysis of this, and this adequate analysis, which we hope to have in the next several months, will depend on whether the FLEETSATCOM launch is successful. I did not feel that putting money into the 1982 budget at this time was justifiable.

If we should have a FLEETSATCOM launch failure, or if we see that we are getting accelerated wear or losing parts of the on-orbit FLEETSATCOMs, we will reexamine the situation and reprogram money. But it is an area that we are looking at actively. We hope to have more definitive results in the next month or two.

Senator WARNER. Would a more attractive option be to deploy a number of additional FLEETSATs either in lieu of or in complement to LEASAT?

Dr. VAN TREES. Essentially, that is what the contingency money would be for. Buying more FLEETSATs, would be one option. Another option, which is being considered but at first look is not attractive, would be to have more SDS's. They are a more expensive satellite and have another basic mission, and that is not a very likely choice.

A third option would be to change the actual design of the LEASAT which has not been launched yet to give it some of the additional capability. Those are really the range of options. But it would be within that family. With that lead time, you would not go to a completely new satellite. That is what this insurance or contingency money would be for, for one of these options.

Once again, after we establish whether there is going to be a gap, it will then be a question of the best way to fill that gap if it exists.

Senator WARNER. In support of that program, what is the availability of Fleetsat?

Mr. VAN TREES. Do you mean the availability of buying more FLEETSATs?

Senator WARNER. Yes.

Dr. VAN TREES. I would assume that the manufacturer would be happy to supply more FLEETSATS.

Senator WARNER. What is the timeframe?

Dr. VAN TREES. A typical time from when a contract is signed to the time that a satellite is ready to launch when it already has been developed is perhaps 36 to 42 months.

Senator WARNER. General Ellis, do you have any comments that you wish to make on this particular line of questioning?

General ELLIS. Well, this is one of the few areas where we have a little disagreement with Dr. Van Trees. We believe that the uncertainty is such that it should have been covered in the 1981-82 supplement. It is on our list of priorities.

Senator WARNER. That is clear enough.

Let us switch to a somewhat different subject which is really a problem in the Congress, but any advice that you can give us would be appreciated.

AUTOMATIC DATA PROCESSING EQUIPMENT

In your personal, professional opinion, are statutorily imposed and legislatively mandated regulations interfering with the timely and efficient procurement of automatic data processing equipment or otherwise impeding the modernization of key systems within your respective areas of responsibility?

General DICKINSON. In my opinion, sir, the Brooks Act and the followon Paperwork Reduction Act do constitute a major impediment to timely procurement of automatic data processing equipment. The impact is not only in the strategic area that we have been discussing throughout this hearing, but in the effect on all services, particularly on those systems that need to emphasize survivability, standardization for maintainability, and supportability under wartime conditions when you cannot easily bring in a variety of repairmen and parts.

It is certainly true that we appreciate the help from the Hart-Goldwater report in this area. We appreciate Senator Jackson's interest during the discussion of the latest legislation last year.

Senator WARNER. Are there any other reports from within the Department of Defense to your knowledge or elsewhere that support the Goldwater-Hart thesis?

General DICKINSON. The reports from the President's reorganization project in the ADP section commented that the implementation of the Brooks Act has led to an excessively long procurement cycle, of 3 to 5 years and more, on which results in fielding obsolescent equipment.

They commented on, and we are all concerned about the average age of computing equipment within DOD. It is excessive by any standard. I think that the original objectives of the act are highly supported by everyone, but it was conceived originally that there would be mass buys by the General Service Administration of computer equipment which would lead to economies, and it was also to support competition in those buys.

In every case, except one, involving \$500,000 in procurement by the Air Force over the last 3 years, that procurement authority has in fact

been delegated to the Air Force. In other words, GSA practically does not procure the equipment that DOD uses.

But there is a very large body of administrative regulations, and so on, that have grown up that must be complied with in order to get that redelegation of authority. These provisions involve the details of the procurement, the requirements that are looked at, and the specific proposal as far as procurement is looked at, not only by GSA but also reviewed directly by members of the Government Operations Committee staff beyond GSA.

The direct net effect of all of that is severe, but actually the indirect delays and effects of the things that people do to prepare to get those kinds of delegation of authorities, is probably much larger than the direct effects.

Senator WARNER. General Ellis?

General ELLIS. I agree with everything that General Dickinson has said. It has impacted on not only our command and control, but our intelligence handling and in our war planning. Any relief that we can get for the Defense Department in that connection would be certainly desirable.

Senator WARNER. Mr. Secretary?

Dr. VAN TREES. Thank you, Mr. Chairman.

Certainly, my personal view and the ASD C³I's view is that it really is an anachronism. It was important to have this a number of years ago, but two things have happened. One involves the hardware. That is, buying the actual computer has become much, much cheaper over the years in terms of the same capability. But the cost of the software program to make the computer work typically runs 8 to 10 times the cost of the hardware. So, when you buy computers, you have to take into account not just the cost of the computer, but how much it is going to cost you in terms of manpower and time to get it programmed to run.

So, the technology has changed, and it has changed the thrust of how you should buy computers. Certainly General Dickinson's comments are very well founded. As soon as the Undersecretary Designate, Mr. DeLauer, is on board, I plan to address this with him as one of the high priorities that he should look at.

So, I very much agree with the two previous sets of comments.

Senator WARNER. Would any of the other witnesses care to comment?

General, do you wish to add any comments?

General HARTINGER. I agree, sir, that when you have a computer product as important as the one that we have, at NORAD, we should not be competing with the procurement of business machines. I think that a good example of what can be done in an emergency was demonstrated by the establishment of our off-site test facility.

Now, we do not have to test the system with our operation of computers. We can do that down town in Colorado Springs in this new off-site test facility, which became operational from go-ahead. I think that in instances like that, we must be able to do it in the most expeditious manner possible.

Senator WARNER. Thank you.

Gentlemen, we will submit questions for the record, but I think that we have made a good record this morning, and you have my personal assurance that I am going to go back and study the record of this morning very carefully, and I will perhaps consult with you individually to get any supplemental information that I feel necessary.

I thank each of you for joining us this morning, and you have made a record which I think will enable me and other members of the committee to go forward and achieve these goals which you really have devoted your lives and careers to.

Thank you, very much.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

PAVE PAWS

Senator WARNER. What is the status of the program to deploy "southeast" and "southwest" PAVE PAWS radars?

Dr. VAN TREES. The PAVE PAWS system currently consists of two operational sites. The need to complete the PAVE PAWS system, by deploying "southeast" and "southwest" radars and increasing the power-aperture product at all sites, is acknowledged and was recommended in the "OSD Master Plan for Ballistic Missile Tactical Warning and Attack Assessment (Fiscal Years 1980-89)," 31 March 1979. However, the Five Year Defense Program provides resources only to continue operation of the two existing radars as now configured.

General HARTINGER. There are no funds currently allocated for the development, procurement or deployment of a Southeast or Southwest PAVE PAWS.

General ELLIS. The program is in a planning stage only, Senator. No funding is identified for either site in the Fiscal Year 1982 President's Budget or the supplementals.

PAVE PAWS FUNDING

Senator WARNER. If we set out to deploy these systems what would be a reasonable schedule? How much money could be efficiently used in fiscal year 1981 and fiscal year 1982?

Dr. VAN TREES. Our best estimates indicate we could have fully operational sites in the southeast by [deleted] and the southwest by [deleted]. We would effectively use \$1.5 million in fiscal year 1981 and \$107 million in fiscal year 1982. The fiscal year 1981 funding would support initiation of site surveys and preparation of environmental impact statements for the two new radars. The fiscal year 1982 increment would provide for acquisition of a basic southeast PAVE PAWS radar and a power-aperture product upgrade to the existing Otis radar. The southeast location has priority due to near-term maintainability problems associated with the existing systems. An estimated \$50 million is needed to resolve these problems at the existing Eglin (FPS-85) and MacDill (FSS-7) radars [deleted].

General HARTINGER. Our best estimates indicate we could have fully operational sites in the Southeast by [deleted] and the Southwest by [deleted] and could effectively use \$1.5 million in fiscal year 1981 and \$107 million in fiscal year 1982. However, to verify the accuracy of these estimates I recommend they be validated by HQ USAF.

General ELLIS. Given appropriate funding, Senator, [deleted]. One and a half-million is required in fiscal year 1981 to begin work on the Site Surveys and Environmental Impact Statements (SS/EIS) for the Southeast and Southwest radars. In fiscal year 1982 \$71M would allow a contract to be awarded for the building of the Southeast site. [Deleted.]

EIS SCHEDULE

Senator WARNER. What are the constraining factors: Land availability? Environmental impact statement schedule? etc.?

Dr. VAN TREES. It is my understanding that the proposed sites would be on existing Air Force installations, so land acquisition should be minimized, if

required at all. The Site Surveys Environmental Impact Statements could be a determining factor, but previous experience in developing the surveys and EISs for the Otis and Beale locations should facilitate this phase. However, the dominant schedule constraint appears to be the ability to update the procurement specifications and award a contract within a reasonable time (9-15 months) after direction to proceed is given to the acquiring agency.

General HARTINGER. While determination of these types of constraining factors are best addressed by the Service headquarters, it is my understanding that EIS, land-acquisition, Request for Proposal and the ability to be on contract in 12-18 months from start date may be possible. Recommend this estimate be verified with HQ USAF.

General ELLIS. Senator, land availability is no problem since they will be sited on existing military bases. The schedule addressed earlier, however, is contingent upon awarding a sole source contract to Stanford Research International for the Site Surveys and Environmental Impact Statements (SS/EIS). Their previous work on the Otis and Beale locations would permit a rapid development of the SS/EISs for two new locations.

Senator WARNER. In your personal and professional opinion, are statutorily imposed and legislatively mandated regulations interfering with the timely and efficient procurement of automatic data processing equipment or otherwise impeding the modernization of key systems within your respective areas of responsibility? (This question was asked, and answered in the hearing—additional comments for the record are welcome.)

Dr. VAN TREES. I do believe that statutorily imposed and legislatively mandated regulations are interfering with the timely and efficient procurement of automatic data processing equipment used in support of our military command and control and communications and intelligence functions. It is not so clear to me, however, how the fault is distributed across the statutory enactments, in OMB and GSA regulatory implementations, and our own DOD procedural implementations. Each of these mechanisms causes its share of the experienced delays and decision problems in system implementation. Clearly, the regulations and implementations grew from 89-306 and complexity and inconsistency have grown over time since 1965. Our initial assessment of the problem convinces me that a more detailed analysis of the process is required to identify where the actual problems have been experienced before I can suggest, take, or recommend corrective actions. I should note that a study of the regulatory environment is underway by DOD's acquisition policy people. I have also initiated action to review current and past data to identify the reasons for these acquisition and development delays. In addition, two potentially significant studies on this issue, one by the Air Force and one by GAO, are nearing completion. We would like to incorporate the results of those activities into our analysis. We anticipate identifying the necessary corrective actions within the next 6 months.

General DICKINSON. I would like to state that the new layers of regulation which will result from the recently passed Paperwork Reduction Act, Public Law 96-511, will further remove decision authority from mission responsible managers. Military leaders in DOD opposed passage of The Paperwork Reduction Act because they believed it would increase acquisition lead time with little value added in the final procurement. However, the act was passed.

Their opposition was based upon the serious damage which has occurred under Public Law 98-306 (The Brooks Act) during the past 16 years it has been in effect. The Brooks Act has seriously impeded the acquisition of modern, highly capable ADP equipment. As a result, the Department of Defense ADPE inventory is drastically outdated. Private industry would never attempt to operate with the obsolete equipment that is found throughout the military establishment. This not only impacts economy and effectiveness directly, it has a devastating secondary effect in hurting our ability to attract and retain good data processing people. Top flight talent is unwilling to work with outmoded gear. The combined effect of the old Brooks Act (Public Law 98-306) and the new Paperwork Reduction Act (Public Law 96-511) will have an even more dramatic and adverse effect than has already occurred in the past 16 years.

The principal intent of the original Brooks Act was to insure competition in a market strongly influenced by Federal procurement and dominated by a single vendor. The act established GSA as the Federal focal point for acquisition and management of ADP resources. It also tasked the Department of Commerce with development of Federal Data Processing Standards and the Bureau of

the Budget with establishing Federal policy. GSA developed a comprehensive set of rules in the Federal Procurement and Property Management Regulations (FPR/FPMR) in the 1969 time frame.

Since 1976, emphasis has been concentrated on eliminating noncompetitive procurements.

The Brooks Act implementation is becoming increasingly obsolete and is falling further behind in fulfilling management needs. Software costs now exceed hardware costs by a ratio of approximately 80 to 20 percent. The Federal government, and particularly DOD, no longer have a significant impact on the competitive nature of the ADP marketplace. The Federal share of the current market is estimated to be substantially less than 10 percent hence does not control marketplace competition. The DOD slice would therefore be much less than 5 percent of the total market. The only result of continued overlapping intensive management as provided under the Brooks Act and now in addition the Paperwork Reduction Act will be to further impair DOD data processing. DOD cannot afford to maintain the existing obsolete ADP equipment along with the high cost of upgrading it under the current procedures. Control and procurement procedures must be streamlined to reduce the negative impact on DOD automation. The Brooks Act and the Paperwork Reduction Act should be repealed—at least as they relate to DOD. Otherwise, DOD will continue to have a second-rate ADP capability and therefore a second-rate fighting capability.

Senator WARNER. In greater detail for the record, specifically what are the regulations and legislation which are causing such difficulties?

Dr. VAN TREES. The difficulties derive from the Brooks Act (Public Law 89-306) and potentially the Paperwork Reduction Act (Public Law 96-511). With regard to the latter Act, we have an Implementation Task Force identified which will focus on reducing inappropriate regulatory overhead. It thus appears that most problems derive from the implementation of the Brooks Act, including both internal and external regulation and processes. The additional visibility which we will gain in the analysis over the next few months will allow us to identify the relative impacts of these factors.

General DICKINSON. In regard to the very large body of administrative regulations and legislation that have grown up as a result of the Brooks Act the most notable are the Federal Procurement Regulations (FPRs), Federal Property Management Regulations (FPMRs), the Office of Management and Budget (OMB) Circulars and Bulletins, Defense Acquisition Regulations (DARs), and consequently Service regulations, which have established various processes for validation and approval of ADP requirements. The end result of this regulatory overhead and overkill is threefold. First, it often induced monetary inefficiencies by precluding an agency from obtaining newer and less costly ADP equipment and services. Second, it removes the decisionmaking process from the Service level where knowledge and understanding of the operational requirement resides and places it within ADP bureaucracies of GSA and OMB not familiar with defense requirements. It leads to a suboptimized decision process where the end users requirement and intent are often unknown or ignored. Finally, it requires additional time and personnel to prepare and staff the numerous documents needed to obtain approval of a requirement. At many command headquarters the full-time efforts of approximately 30-40 people are dedicated to preparing ADP acquisition documents.

It is difficult to document precisely but the secondary efforts of the mass of regulations are in my opinion far more damaging than even the direct delays. Needed military programs are not started because of envisioned difficulties, etc.

The FPRs and FPMRs, which are used in the implementation of Public Law 89-306, are the prime sources of the regulations that inhibit ADPE acquisition. While some regulations are appropriate for some programs the blanket approach is both cumbersome and stifling and results in decreased combat capability.

1. GSA sharing exchange screening—FPMR 101-36.2.
2. Reutilization screening—FPMR 101-36.3.
3. Telecommunications study—FPMR 101-37.2.
4. Federal Information Processing Standards—FPMR 101-36.13.
5. Collocation study—FPMR 101-36.905.
6. GSA security requirements—FPMR 101-35.300.
7. Solicitation document submission to GSA—FPR 1-4.1104.
8. GSA control of acquisitions—FPR 1-4.1104.
9. Software conversion studies—FPR 1-4.1109-13.

10. Compatibility limited requirements—FPR 104.1109-12.
11. Restrictions on use of simulation—FPR 1-4.1109-21.
12. Restrictions on use of benchmarks—FPR 1-4.1109-22.
13. Restrictions on use of remote terminal emulation—FPR 1-4.1109-23.

In addition to the problems of the Brooks Act and the Paperwork Reduction Act, there are actions by other governmental agencies which affect our ADP and military capabilities of DOD.

Department of Labor's decision to apply the Service Contract Act to ADP maintenance and professional personnel can add at least 90 days to the procurement process and serves no useful purpose either in protecting these individuals or the Government. The demand for qualified high-technology personnel by companies usually exceeds supply so that quite attractive wages must be offered to hire them. Witness as an example of this the continuing loss of trained, mid-level armed services enlisted technicians to well-paying jobs in the private sector. Also, the evils of low-dollar contracting which precipitated the original passage of the Service Contract Act just don't exist in high-technology industries.

A growing and desirable source of supply for automatic data processing systems needed by the Department of Defense comes from firms that are commonly called "systems integrators." Using a mixture of equipment subcontracting and their own technical software assets, they provide total system support to a growing number of customers. This source is desirable because it broadens both the industrial and competitive base for commercial computers to be used for national defense applications. Recent decisions of the Department of Labor regarding the Walsh-Healy Public Contracts Act seem to shed doubt on the eligibility of these firms, particularly the minority-owned business enterprises, to receive Federal contracts. It is suggested that since the object of Federal contracting is to obtain needed goods and services at the lowest overall cost, price and other factors considered, it should be immaterial to Department of Defense as to whether or not the winner of a contract is manufacturer, regular dealer or any other category of supplier of ADP. In summary, the law has outlived its usefulness and should be repealed.

Senator WARNER. Can you provide an estimate of the average additional time-penalty paid in procuring ADPE for your various areas of responsibility which these regulations contribute to or cause?

Dr. VAN TREES. The average additional time-penalty incurred by adherence to these regulations is difficult to determine prior to completion of the analysis to which I referred. I will provide the Committee a more precise figure in the report of our findings.

General DICKINSON. An estimate of the average additional time-penalty paid in procuring ADPE for which these regulations cause varies. Examples of the impact on the Services are as follows:

The first example is the Triad Computer System (TRICOMs) at the Strategic Air Command (SEC). On 26 September 1975, an effort was undertaken by SAC to define processing requirements for upgrading TRICOMs in order to satisfy a major Single Integrated Operational Plan (SIOP) revision. A Data Automation Requirement (DAR) was prepared and submitted to HQ USAF on 5 January 1976 (101 days later). The DAR was approved by SAF/FM on 26 May 1976. Thus, the requirements definition to agency approval process took 243 days. The GSA acquisition approval phase, including development of a Request for Procurement (RFP) took 478 days after DAR approval. The contract was not awarded until March 1978 and installation took place on 5 May 1978—a full 955 days after the process had begun, and 710 days after the requirements had been approved. This 710-day period is directly attributable to the regulations which have grown around the framework of the Brooks Act. When you consider the inflation that occurred during those 478 days that GSA was sitting on this procurement, the cost must have been increased very significantly. Worse, the improvement in the mission capability of SAC was significantly less than it could have been during the time of this delay.

Compliance has been equally costly and has substantially lengthened the time required to obtain ADP resources in the Army. Per GSA procedures, a Delegation of Procurement Authority requires 20 working days plus 5 mail days from receipt of a request. Recent Army experience shows a range of 5 to 340 days. (Arithmetic mean is 74 days, mode is estimated to be substantially higher.) This delay is almost always on the critical path and results in total system delay. Ultimately, however, the individual Contracting Officer looks to the DAR, rendering much

of the preceding Brooks Act processing redundant. The Army has fallen behind the private sector in the acquisition and application of the current more cost-effective technology.

The last example I would like to cite is from the Navy. A recent review of Navy requests approved by GSA in Mar 80 or still at GSA showed that the approved requests had required 2 to 4½ months to process. The requests still at GSA had been there from 10 days to 6½ months. Additionally, not all factors have been considered in the past in determining the most economical means of procuring ADPE. Consequently, the Navy has not always acquired ADPE which has the lowest life cycle costs. Further, the impulsion toward full competition has inhibited Navy people from extending system standardization because of the perceived difficulties of justifying sole-source acquisition of the additional equipment. The special procurement rules (Federal Procurement Regulations instead of Defense Acquisition Regulations) require special training and organization structures in the Navy and add time to the acquisition process. Specifics regarding the negative impact of Public Law 89-306:

On 26 October 1977, Navy requested a delegation of procurement authority to replace the Naval Academy's academic computer. Navy asked to acquire the \$2.8 million replacement from a specific vendor because of estimated \$3.3 million conversion costs if acquired from any other vendor. On 21 April 1978, GSA granted procurement authority subject to eleven conditions, including:

(a) replacement of the acquired academic computer within 8 years although it would be owned by Navy,

(b) immediate action to replace a separate installed administrative computer also owned, and

(c) GSA approval of any change to the number of computer terminals (terminal cost \$1,000 to \$2,000).

The project was delayed half a year, the Navy was told to submit acquisitions costing less than \$2,000 to GSA for approval, and we were required to replace owned computers at a later date, whether or not economics and use dictated replacement.

The more important impact, however, may be felt indirectly. It is in the extremely detailed documentation and the multitude of internal reviews required before a request is sent to GSA and the House Government Operations Committee. These dates and reviews consume resources better used in direct military functions. Worse yet, this process breeds a committee solution—a "safe solution" designed not to procure the optimum ADP technology from a military point of view, but the ADP technology which will satisfy the perceived requirements of GSA and the House Government Operations Committee. The regulations lean away from picking up new technology; we avoid upgrades for solely economic reasons; we get the minimum required—not the best economic deal, for the government nor the best military deal for our national security.

Senator WARNER. To what degree is ADPE now integral to the range of military combat and support equipment such that, legislation, regulations and management practices which adversely affect efficient and timely ADPE procurement can be said to have an adverse effect on the ability of the U.S. Armed Forces to perform their varied missions?

Please give examples of this interrelationship of ADPE and mission performance for the record.

Dr. VAN TREES. "ADPE," more specifically digital computation, is pervasive throughout the spectrum of military activities. For example, computers are the processing heart of our tactical missile warning systems. They are the backbone switches of our communications networks which relay command and control and intelligence information. When our military forces must be deployed, computer systems at the transportation commands match requirements with available transportation resources and provide schedules. Automated logistics and personnel systems ensure the flow of materiel and men necessary to sustain operations. The computer-controlled common user communications networks ensure that necessary administrative and logistic messages flow properly, while the vital automated command and control communications networks provide the commander the links to employ forces and to keep the national command authorities advised of fast-breaking events. The integrating core of aircraft, ship, tank and automated systems is the digital computer. The introduction of automation to such a degree has been necessitated by the decreased reaction time and the increased timing and tempo of military operations in the latter

half of the twentieth century. Concomitantly, as the size of our military forces has decreased over the years, the slack has been taken up in large part by the substitution of automation for manual performance throughout a large range of military activity.

The need for standardization of ADP for the tactical forces is particularly important. It is imperative for survivability that commonality and compatibility of ADP be achieved and maintained in order to maximize standardization of spare parts, to be able to exchange material for backup purposes when battle damage occurs, to simplify training of operators and maintenance personnel, to allow operations and maintenance personnel to back up other systems when casualties occur, and to enhance interoperability between systems. We can't have 16 Army Divisions with 16 different types of ADP equipment or 16 types of ADP equipment in one Brigade.

ADPE is integral to the full range of military equipment and functions, ranging from automatic fire control in the M-1 tank to the most critical command, control, and communications, intelligence and field logistic functions.

The F-15 would lose 50 percent or greater of its capability without its on-board computational power. The Navy's E-2C is essentially a flying computer with a radar attachment, as is the AWACS. In short almost all state-of-the-art, modern military equipment is almost totally dependent on computers. The military Services are so dependent on ADPE that they cannot effectively perform their missions without it. Therefore, anything which adversely impacts the efficient and timely acquisition of ADPE has an adverse impact on the forces to perform their varied missions.

Senator WARNER. What alternatives to the present statutorily mandated method of procuring ADPE could be instituted either by adopting modified procedures under 89-306, or by legislative direction, so as to allow more rapid upgrading of data processing systems while ensuring that the public interest in avoiding waste and preventing mismanagement is fully served?

Dr. VAN TREES. The upgrade of computer equipment embedded in defense systems may be more efficient to manage under system acquisition and modification procedures than under Public Law 80-306. These instances are often constrained to interface with existing equipment and to utilize existing software, recognized to be the long-lead and "big-ticket" item. The technical and management oversight afforded by DOD's system acquisition process is at least as rigorous as the ADPE process and must be followed in any event to assure that mission needs are met.

General DICKINSON. As noted in response to an earlier question, our first preference is to repeal The Brooks Act (Public Law 89-306) and the Paperwork Reduction Act (Public Law 96-511) as they apply to DOD. If that is not possible, as an absolute minimum, DOD should be provided a blanket delegation of procurement authority. In this way, the acquisition cycle we presently experience can be reduced; especially when an urgent need has been established at the at the DOD level.

A precedent has been established in other government agencies, such as the National Aeronautics and Space Administration, National Security Agency, Defense Intelligence Agency, and Federal Bureau of Investigation. Blanket delegations allow more flexibility and responsiveness to meet agency mission needs. The result of such an action for the critical systems within the DOD would significantly reduce the required acquisition time for ADP systems.

The DAR procedures are used by DOD to acquire all other type items. The DAR contains procedures which can insure that the most cost-effective system which meets DOD requirements are acquired. This DAR procedure should be equally successful in regard to ADP, without all of the problems under the Brooks Act methodology. If the DAR is good enough for acquisition of F-15's, XM-1 tanks, and Navy carriers, why isn't it also good enough for DOD computer acquisitions. Why should ADP be singled out for special treatment? What's so unique about ADP to justify an entirely different procurement process?

We must be able to consider all costs of ownership, development, and operation to insure that we obtain these systems at the lowest total overall cost.

We must be able to acquire ADPE which is an integral part of a higher order system or organization as a part of that system or organization, not separately. Under current rules, we must separate the ADPE from the end item. This is very damaging. This is true not only in weapons systems, but in other areas of automation such as communications, wartime logistics and wartime personnel systems.

Senator WARNER. In addition to the report of our own Senators Hart and Goldwater, which points quite dramatically to the problems being encountered in modernizing our ADP equipment due to encumbering Federal regulations, have other analyses supported the contention that a serious problem exists in this area due to Public Law 39-306?

Dr. VAN TREES. A number of studies and analyses have been accomplished in this area, both within DOD and without. They all support the contention that serious problems do exist. In general, however, the studies are ad hoc and descriptive in approach. As part of our review we intend to precisely identify the cause of delays alluded to in the previous studies and to identify associated technical (performance) impact. This rigorous, systematic analysis will lead to a set of recommendations and changes which I believe will be responsive to the actual problems.

Senator WARNER. I understand that steps were initiated late in the Carter Administration to seek for the Department of Defense a blanket delegation of procurement authority (DPA) for ADPE acquisition.

Where does the request, initiated by Deputy Secretary of Defense Claytor, stand at this time?

Dr. VAN TREES. The request for delegation of general procurement authority was submitted to the Administrator of General Services on January 8, 1981. There have been follow-on discussions among representatives of the Under Secretary of Defense for Research and Engineering, the Assistant Secretary of Defense (Comptroller) and the GSA Commissioner of Automated Data and Telecommunications Service (ADTS). These discussions have been to clarify the intent and extent of our request. We have determined that approximately 30 percent of the DPAs granted in 1980 would have been covered by the blanket exemption sought. The Chairman, House Government Operations Committee, has expressed his strong opposition to this request and we do not expect any action by GSA until the new team is in place. Further clarifying discussions are scheduled with ADTS.

General DICKINSON. My latest information is that the Office of the Secretary of Defense is currently negotiating the terms and conditions under which DOD will implement the Delegation of Procurement Authority (DPA). We have been given assurance that a delegation will be forthcoming though it appears it may be much less than we originally asked for. OSD is planning to continue discussions with GSA on the 26th of March. Dr. Van Trees answer to this may be more definitive than mine.

Senator WARNER. What effect, in your personal and professional opinion, would you expect such a DPA, if approved by GSA, would have?

Dr. VAN TREES. The effect of the DPA will be helpful, but the Services will still be bound by the Federal Procurement and Federal Property Management Regulations. It is unlikely that any fundamental change to procedures would occur without a change in the legislation governing computer technology. On the positive side, however, is the deletion of the time required for GSA review of our procurement requests expended in justifying our acquisition methodologies before GSA. For the categories of equipment covered by the request, the blanket delegation of authority would eliminate the effort and time necessary (minimum of two months and in some cases two or three years) to begin with the solicitation process.

Senator WARNER. Would you provide for the record a history of a typical ADPE upgrade procurement program identifying the critical path to the acquisition of the equipment involved, showing the various steps, including formal and informal Congressional reviews to the degree that these can be identified, and estimating the additional incremental delay in which these steps represented in bringing the new capability on line?

Dr. VAN TREES. We will provide a representative case history of an ADPE upgrade procurement program as part of our report. I believe that representative systems can be more effectively selected after our analysis has more clearly delineated the major delay points in the acquisition process.

General DICKINSON. I will provide to you at a subsequent date the history of a typical ADP upgrade. I did not have this developed and it will require a few days to prepare. I request your permission to submit that to you separately.

Senator WARNER. Has the evolution in computer technology, that is micro-miniaturization, advances in software architecture, exacerbated in recent years problems with ADPE procurement inherent in the Brooks Act acquisition process?

Dr. VAN TREES. There are several ways in which the evolution in computer technology has exacerbated the impact of delays in the acquisition process. For example, as the state of the art changes more rapidly, delays in acquisition result in the implementation of systems using non-state-of-the-art technology. Further, legislation such as the Brooks Act was designed to achieve economies of scale in the acquisition of computer systems. Today, as I mentioned earlier, the software portion of system cost exceeds considerably the cost of the hardware. This relationship must be taken into account in determining the true cost effectiveness of a system acquisition. It is not clear that current regulations provide sufficient flexibility to adjust to the rapid evolution of computer technology.

General DICKINSON. As very small ADPE devices become tougher, cheaper and more powerful, they are being incorporated into more and more equipment, both military and nonmilitary. They are being used for control of the larger devices and are vital to their operation. They are being used to run automatic test equipment to perform fault diagnosis, and to do many other things automatically. Under the law and the GSA rules, they are ADPE and must be acquired in the same way as a multi-million dollar, fixed-site computer. The Brooks Act addresses what now amounts to a relatively small area of automation: procurement of ADP equipment and maintenance. The implementation of the Act, plus the effect of other legislation makes it unreasonably difficult for the DOD to take advantage of new ADP technology before it becomes obsolete.

Senator WARNER. As an operational commander, as well as JSCS Director, what capabilities absent from our present C³ satellite constellation are most worrisome to you?

General ELLIS. [Deleted.]

OPTIONS

Senator WARNER. What are the near, medium, and long-term options available to provide the capabilities which are now lacking and what would be the approximate cost of acquiring such capabilities in each of these time frames.

General ELLIS. Senator, the near term options include replacing the FLTSATCOM satellites expected to fail in [deleted]. The LEASATs, now scheduled for service in 1984 and considered a candidate, [deleted]. Another option is to deploy the DSP Mobile Ground Terminals to increase survivability in the trans and post-attack periods. Additionally, we must increase ground facility security to reduce the threat from sabotage.

The medium and long term options include deployment of the new C³ architecture, in the 1988 to 1990 time frame, to survive and ensure for a timely NCA decision and rapid SIOP execution. This architecture must endure to permit the CINCs command and control of their forces through post-attack which includes reconstitution and retargeting. Another requirement is [deleted]. Since the JSCS does not deal in costing figures for C³ programs, the approximate cost of acquiring these capabilities will be provided by JCS/C³s.

LEASAT/FLEETSAT OPTIONS

Senator WARNER. What are the operational implications of relying on LEASAT, vice the currently deployed FLEETSAT satellites, for part of our strategic C³ requirements in the mid to late 1980s?

Would a more attractive option be to deploy a number of additional FLEETSATs either in lieu of, or as a complement to, LEASAT?

Please provide for the record the respective costs, launcher requirements, reliability and performance features, etc., of the various LEASAT-FLEETSAT options?

Dr. VAN TREES. Relying on LEASAT vice FLTSAT in the mid-late 1980s has an impact on both tactical and strategic users. For tactical users LEASAT has less UHF capacity than FLTSAT. This situation can be alleviated by employing a new more efficient system called "DAMA" with LEASAT. Since DOD plans to deploy the new "DAMA" system in the early 1980s the reduced capacity of LEASAT should not have a serious impact on tactical users.

[Deleted.]

The deployment of additional FLTSATs is only one of the options to solve this problem. Other options include [deleted]. We are presently evaluating these options to determine the most cost-effective solution. The results of these investigations will be available in about two months.

General ELLIS. Senator Warner, LEASAT has limitations that impact strategic C³ requirements in the mid-late 1980's. As I already stated [deleted].

The launch of additional FLTSATCOM satellites, in lieu of the LEASATs appears to me to be a more attractive option. [Deleted.]

The JSCS supports the JCS/C's evaluation that provides strategic C³ connectivity as the FLTSATCOMs fail. The costs for the various options will result from the JCS/C's study.

Senator WARNER. Dr. Van Trees, how does the "new architecture" satellite system described in your statement [deleted] differ from the STRATSAT system of previous years?

Does the Department of Defense feel that, in view of these differences, Congressional concerns about the feasibility and affordability of a survivable satellite system have been addressed?

Dr. VAN TREES. The [deleted] differs considerably from the STRATSAT. First, it will meet the needs of tactical [deleted] as well as strategic users. In addition the emphasis is on [deleted]. The main objective of this system is to provide more capability over the spectrum of conflict, for a variety of users. It will have more capacity and better jam resistance than the STRATSAT. [Deleted.] The capacity will be sufficient to satisfy the most critical Army, Navy, Marine and Air Force, as well as NCA and CINC needs. [Deleted.]

MILSATCOM systems must provide command and control of strategic and tactical forces throughout the spectrum of conflict. I believe that the new architecture will satisfy Congressional concerns, because, for the first time, it meets the needs of the total DOD MILSATCOM program. We believe it is the best cost-effective solution to real military requirements. We must recognize that these systems, although expensive, need to include attributes such as jam-resistance, [deleted] survivability, and endurance.

Senator WARNER. General Dickinson, you mentioned the effect that [deleted]. General DICKINSON. [Deleted].

TACAMO

Senator WARNER. General Ellis, in your hat as Director, JSCS, do you share the concern expressed by Dr. Van Trees about [deleted]. Do you personally favor the replacement of these EC-130 aircraft with new jet airframes for the TACAMO mission?

General ELLIS. Yes, Senator. [Deleted.]

Senator WARNER. Dr. Van Trees, could savings in resources and improved mission performance be realized by bringing an EC-X aircraft into the fleet earlier than presently planned, by taking a proven commercial airframe and loading it with the present TACAMO electronics suite, thereby easing the need to procure additional EC-130s in the next few years?

Dr. VAN TREES. There are currently no funds in the fiscal year 1982 program for EC-X so, strictly speaking, there is no EC-X "presently planned." [Deleted.]

If the EC-X program is funded, the use of a proven, in-production aircraft would indeed accelerate the operational availability date of the EC-X, and this approach will definitely be carefully examined by the Navy and OSD. However, we believe it would be a mistake to limit the field of candidate aircraft to commercial airframes. For example, the E-3 airframe (now used for the AWACS) is a proven, militarized airframe which should be considered as a candidate EC-X airframe. [Deleted.]

Using the present TACAMO electronics suite aboard an EC-X would also accelerate the operational availability date of the EC-X. [deleted].

Senator WARNER. For all the witnesses, is there a difference of opinion among the witnesses as to the magnitude of the threat posed to U.S. communications systems by jammers [deleted].

General DICKINSON. The Defense Intelligence Agency (DIA) advises [deleted]. [Deleted.]

General HARTINGER. [Deleted.]

Senator WARNER. How difficult is it to adapt a radio transmitter so as to make it a jammer?

Dr. VAN TREES. A radio can be used without modification to disrupt communications in the frequency band covered by the radio. One method is [deleted].

Senator WARNER. In general, how difficult is it to locate in a prompt fashion the whereabouts of a jammer?

ANSWER. The ability to locate a jammer is generally dependent upon three factors:

(a) The frequency of the jammer and the corresponding frequency coverage of the collection system.

(b) The type of modulation used by the jammer and the corresponding demodulation capability of the collection system.

(c) The availability of a direction-finding capability in the opposing collection system.

Jammer location, as with emitter location in general, requires either multiple collection sites or a mobile collection platform. The time required to locate the jammer, assuming the above factors are met, depends upon the duration of the jamming signal and upon the type of collection employed (multiple systems or single system). With a fixed single collection site no precise location is possible; with a single mobile site, location can be determined if the emitter (jammer) is fixed and if signal is present for a sufficient period of time to allow multiple lines of bearing to be observed over a reasonable baseline. Multiple systems are clearly most desirable. Technically, the task is not difficult.

[Deleted.]

Senator WARNER. How would you characterize the threat to U.S. ground-based warning and C³ facilities, in CONUS and elsewhere, from sabotage and paramilitary operations? To what extent have security and hardening upgrades performed to date been effective in mitigating the dangers posed from this quarter?

General DICKINSON. Defense Intelligence emphasis in this area has been primarily [deleted.]

[Deleted] our corrective actions are specifically aimed at strengthening vulnerabilities known to exist. The field of operations security is continuously analyzing our systems and operations to determine weaknesses and initiate remedial actions. All nuclear CINCs are working to correct vulnerabilities.

Senator WARNER. What research and development is taking place to examine the technical feasibility and practical implications of hardening our C³ satellite systems?

Dr. VAN TREES. The problem of hardening must be taken in balance with all efforts to assure the military functional capabilities of our satellites. In this respect, we are pursuing efforts to [deleted.]

Senator WARNER. Is there a recognized need to harden these satellites [deleted]. To what degree does it appear that such hardening is within the state of the art?

Does it appear that other countermeasures, such as diversification and systems redundancy, are more attractive and cost effective ways to go?

Dr. VAN TREES. Current and projected Soviet [deleted.] Soviet space-based [deleted] are being hardened against this possible threat. The Air Force is currently investigating [deleted] techniques for satellite applications. Our objective is [deleted].

Past studies have shown that the most effective technique is to [deleted] for example, a level of hardness and redundancy through proliferation. It is the combination of countermeasures, tailored to the orbit and system, that provides the most cost effective approach.

Senator WARNER. How has the estimated threat to C³ systems been officially changed as a result of the connectivity studies' assessment?

General DICKINSON. The Defense Intelligence Agency (DIA) was heavily involved in the preparation of the threat annex for the SAC C³ study on strategic connectivity in 1979. DIA is involved in providing the threat data for the analyses being performed by the Joint Strategic Connectivity Staff (JSCS). The estimated threat has been [deleted.]

Senator WARNER. "To what degree have necessary C³ improvements identified in these studies been programmed and budgeted?"

ANSWER. Three principal studies¹ conducted during 1979 constitute the basis for specific recommendations which will provide necessary improvements to the WWMCCS. The studies contained a net total of 150 recommendations; where appropriate, inter-related or similar recommendations were merged. The status

¹ Defense Science Board, Report of the Defense Science Board Task on Enduring Strategic Communications, Command and Control (U), ASD C³ TS 092-79, TOP SECRET, 10 October 1979. CINCSAC/CV. C³ Study on Strategic Connectivity, Final Report, Annex A through I, Top Secret, 7 March 1979. USN. CNO, CNO Strategic Communications Continuing Assessment Program, Phase 1 Report Connectivity Study (U), Secret, CNO 094/S 208442, February 1979.

of these 150 recommendations were reviewed during 1980. Seventy-two recommendations addressed operating procedures and were eliminated from further development or investment consideration; the status of the remaining 78 relevant non-operational recommendations are:

(a) Completed or dropped as no longer relevant-----	6
(b) Action being implemented or currently underway-----	38
(c) Under further study by cognizant components-----	11
(d) ASD(C ³ I) guidance directing Service/Agency compliance and the inclusion of all or a specified part of a recommendation in the programming/budgeting formulation process-----	23
Total -----	78

General DICKINSON. Approximately 20 percent of the 114 recommendations in the Navy and SAC connectivity studies involve near-term funding implications. Of these, 10 have been sufficiently defined to warrant fiscal year 1981/82 funding. The fiscal year 1982 Defense Budget includes \$262 million for these near-term improvements. The remaining items are part of an ongoing process still under review. We will continue to monitor present and future programming and budgeting actions to their completion.

C³ FUNDING

Senator WARNER. Can additional funds above those programmed by the Reagan Administration be usefully spent in fiscal year 1981 and fiscal year 1982 for C³ systems upgrade?

General DICKINSON. The fiscal year 1981 and 1982 Defense Budget requests, as revised by the Reagan Amendments, will satisfy our most urgent strategic C³ requirements. However, there are a number of additional initiatives which would greatly enhance the survivability and performance of our critical tactical warning systems, command centers, and strategic connectivity. Desired fiscal year 1982 funding is shown.

1. PAVE PAWS Expansion (\$95.8M).

[Deleted.]

2. Communications Propagation [deleted] (\$2.2M).

[Deleted.]

3. [Deleted.] Hardening of Critical Facilities (\$5.0M).

These funds are required to protect [deleted.]

4. ECX (TACAMO Replacement) (\$25.0M).

TACAMO is the airborne extension of the Minimum Essential Emergency Communications Network (MEECN) for relay of Emergency Action Messages (EAM) to the SLBM force. The aircraft currently used for the TACAMO mission is the EC-130Q [Deleted.]

[Deleted.] Current FYDP funding provides for the procurement of nine new EC-130 airframes to replace older airframes and complete several upgrade programs, including EMP hardening [deleted]. No funding is provided for the ECX. If the ECX Program is initiated in fiscal year 1982, the procurement of new EC-130 airframes and other EC-130 actions will be halted with a cost avoidance [deleted.]

5. [Deleted.] Missile Attack Conference (\$2.0M).

The current communications system used for Threat Assessment and Missile Attack Conferences between the NCA, CINCSAC, CINCNORAD, and others [deleted].

6. Procurement of Additional E-4B (\$261.0M).

A total of [deleted] E-4Bs is required to fully support both the National Emergency Airborne Command Post (NEACP) and the CINCSAC Airborne Command Post missions. The current FYDP provides funding support for [deleted] six of these extremely capable aircraft, [deleted].

7. [Deleted.] Satellite Communications.

Satellite communications [deleted].

8. Satellite Communications Coverage (\$92.0M).

Satellite communications connectivity in the Ultra High Frequency (UHF) spectrum is vital to serve our [deleted].

9. Triad Computer System (TRICOMS) Expansion (\$7.5M).

Triad Computer System (TRICOMS) supports all [deleted].

10. Survivable, Enduring Strategic Communications (\$7.0M)

Research and development must be continued for a pre-, trans-, and post-attack communications system using whatever frequency spectrum provides optimum benefits. Studies and demonstration testing are continuing [deleted.]

11. Ground Mobile Command Center (\$40.0M)

[Deleted.]

12. Strategic Connectivity Engineering Office (\$6.3M)

The current MEECN is designed for the one-way dissemination of Emergency Action Messages (EAMs) from the NCA to the strategic nuclear forces. [Deleted.]

Funding will provide for manpower and the analysis and engineering efforts required to effect a systems engineered approach to the communications supporting these vital functions. Support includes such efforts as near-term enhancements, engineering and planning for midterm enhancements, ad test and evaluation and procedural developments.

13. Strategic Secure Voice Capacity (\$38.4M)

The worldwide [deleted.]

14. Satellite Data System (\$102M).

There is currently considerable [deleted].

The above listing has been coordinated with the Joint Strategic Connectivity Staff, which has provided the following additional initiatives to enhance strategic C³. [Deleted.]

1. [Deleted.]

2. AFSATCOM Secure Voice Network (\$14.0M).

There currently is [deleted].

3. Additional Emergency Rocket Communications System (ERCS) (\$3.0M). To increase the [deleted].

4. Airfield Locators (\$4.5M).

Provides [deleted].

5. Jam-Resistant Secure Communications (JRSC) (\$7.0M).

Additional funding is needed to complete [deleted].

6. Very Low Frequency/Low Frequency (VLF/LF) Improvements (\$9.0M).

There are [deleted].

General ELLIS. Yes, here is a list of programs and their required funding for fiscal year 1981 and fiscal year 1982 in C³ and Strategic Defense.

FISCAL YEAR 1981 SUPPLEMENTAL/FISCAL YEAR 1982 AMENDED BUDGET—STRATEGIC OFFENSIVE C³/STRATEGIC DEFENSIVE C³ CANDIDATES SUMMARY

(In millions of dollars, fiscal years)

Program	OSD		SAC	
	1981	1982	1981	1982
STRATEGIC OFFENSIVE C ³				
E-4B acceleration.....	0	0	0	260.0
Program accelerates acquisition of aircraft Nos. 5 and 6 [deleted] to complete the SAC Airborne Command Post fleet.				
NEACP.....	2	4	2.0	4.0
SAC concurs with OSD submittal. [Deleted.]				
AFSATCOM continuation.....	0	0	63.0	26.0
[Deleted.]				
PACCS EMP hardening.....	0	0	7.0	13.0
Hardens [deleted] EC-135 aircraft.				
Strategic C ³	0	47	0	47.0
SAC concurs with the OSD submittal. Provides resources to continue the development of improvements for command, control and communications strategic connectivity [deleted].				
Strategic C ³ /WIS mod/NORAD.....	25	0	25.0	0
SAC concurs with OSD submittal. [Deleted.]				
ERCS deployment increase.....	0	0	0	3.0
[Deleted.]				
LCC/SHF capability.....	0	0	0	21.0
[Deleted.]				
HF network.....	0	10	0	10.0
SAC concurs with OSD submittal. Provides the resources for the development of an [deleted].				
Adaptive HF acceleration.....	0	0	0	7.0
[Deleted.]				
IONDS enhancements.....	0	0	4.5	7.0
[Deleted.]				

FISCAL YEAR 1981 SUPPLEMENTAL/FISCAL YEAR 1982 AMENDED BUDGET—STRATEGIC OFFENSIVE C³/STRATEGIC DEFENSIVE C³ CANDIDATES SUMMARY—Continued

[In millions of dollars, fiscal years]

Program	OSD		SAC	
	1981	1982	1981	1982
Command post EMP hardening..... [Deleted.]	0	0	0	2.0
CCPDS display/control segment upgrade..... Expands the capability to provide timely presentation of tactical warning/attack assessment (TW/AA) information to NCA and the prime command centers.	0	0	0	13.0
CCPDS front end processor..... New warning sensor systems will interface with CCPDS. The resultant load will exceed the capability unless communications processing is separately accommodated by the proposed front-end-processor.	0	0	0	2.5
DMSP II study..... [Deleted.]	0	0	7.0	7.0
NAVSTAR/GPS enhancements..... Accelerates hardware acquisition, test range construction and availability of replenishment boosters. Procures spares.	0	0	14.0	14.5
STRATEGIC DEFENSIVE C ³				
[Deleted.] Power and cooling..... Provides power bus, air-conditioning, and generator improvements that are necessary to support the ground station upgrades in the defense satellite program. \$1M in fiscal year 1982 is based upon \$3M in fiscal year 1981, if no funds received in 1981 then 1982 requirement is \$2.6M.	0	0	3.0	1.0
[Deleted.] Southeast pave paws..... [Deleted.]	0	0	2.0	71.0
[Deleted.] MGT operations support..... SAC concurs with the OSD submittal. [Deleted.]	0	10	0	10.0
Simplified processing station (SPS)..... SAC concurs with the OSD submittal. [Deleted.]	0	2	0	2.0
[Deleted.] upgrade..... SAC concurs with the OSD submittal. [Deleted.]	5	0	5.0	0
[Deleted.] Mobile ground terminal..... [Deleted.]	0	0	0	32.0
[Deleted.] Survivability enhancements..... [Deleted.] These items are addressed separately in the Strategic Offense C ³ portion.	15	5	34.0	5.0
[Deleted.] Large processing station (LPS) peripherals..... [Deleted.]	0	0	0	30.0
BMEWS site III..... SAC concurs with the OSD submittal. [Deleted.]	0	23	0	23.0
GEODSS completion..... [Deleted.]	0	0	0	29.0

Senator WARNER. Dr. Van Trees, what technical risk is associated with the development of MGT's for the satellite system?

Dr. VAN TREES. The Mobile Ground Terminal (MGT) design has evolved [deleted.]

Senator WARNER. Dr. Van Trees, could an acceleration of this program be accommodated with higher funding levels so as to result in an earlier MGT full operation capability? If so, what would the incremental cost be?

Dr. VAN TREES. The MGT schedule as presently planned is [deleted.]

GLOBAL SHIELD

Senator WARNER. General Ellis, Dickinson, and Hartinger, recognizing that the final returns are not yet in on the Global Shield 81 exercise of the Strategic Air Command's forces, what seems to be the preliminary lessons learned in the C³ and warning areas?

General ELLIS. Mr. Chairman, Global Shield 81 reinforced the need for increased reliance [deleted] systems for tactical warning/attack assessment and the control, direction during trans-attack and post-attack reconstitution of strategic nuclear forces. Strategic force execution and control must rely on the surviving [deleted] systems in the trans- and post-attack phases. These systems not only must be survivable but must be enduring and two way to provide adequate connectivity between the National Command Authorities and the operating forces.

Global Shield 81 also highlighted the critical need for a surviving ground element to take over [deleted] in the post-attack period. This element must be [deleted] equipped with an enduring communications system, and provide compatible interface with other surviving military and civil communications systems. It must provide reliable [deleted.] In addition, the system must handle sufficient feedback data and intelligence information to evaluate damage to resources as well as the effects of our attack on the enemy.

General DICKINSON. The HQ SAC staff is preparing a detailed analysis which will address the "in-house" SAC lessons learned. OJCS participation was primarily as an exercise observer. Our general observations indicated:

1. Global Shield 81 was the most realistic exercise to date. This aspect keeps improving with each exercise. [Deleted.]

General HARTINGEE. NORAD experienced excellent results with our C³ and warning systems during Global Shield 81; [deleted].

ERCS

Senator WARNER. General Ellis and Dr. Van Trees, is the Emergency Rocket Communications System, ERCS, [deleted].

General ELLIS. No. The ERCS is launched on a [deleted].

[Deleted.]

Dr. VAN TREES. The ERCS missions are [deleted].

ERCS IMPROVEMENTS

Senator WARNER. What improvements, if any, are envisioned to make the ERCS more survivable?

Dr. VAN TREES. We have [deleted].

General ELLIS. Senator, we have [deleted].

ACCELERATION OF C³ PROGRAMS

Senator WARNER. General Ellis, how much funding do you estimate would be required to implement the recommendations you have made for acceleration of key C³ upgrade programs? Please provide for the record a detailed breakout of the funds, over and above those budgeted, that could be usefully and efficiently spent in fiscal year 1981 and fiscal year 1982 to accelerate these programs?

General ELLIS. JSCS does not normally assign dollars to programs. As stated earlier, the JSCS mission is to make recommendations which will enhance the strategic connectivity to the Chairman, JSC.

PROCEDURAL CHANGES

Senator WARNER. General Ellis, additionally, please submit an estimation of the dollar costs involved in implementing your recommendations for procedural changes.

General ELLIS. The total dollar value for procedural fixes will be minimal, Mr. Chairman. Most of the procedural fixes recommended center around changing existing directives, rerouting or redirecting communications.

TWO-WAY COMMUNICATIONS

Senator WARNER. How important do you believe the need for two-way communications with the SAC's SIOP and Secure Reserve Forces to be?

General ELLIS. Senator Warner, the need is absolutely essential. As a commander I must be able to continuously determine the status of my forces, to execute them when directed by the NCA and to reconstitute and retarget those returning forces for restrike, if directed.

OPERATIONAL DEGRADATION

Senator WARNER. What operational or mission performance degradation would you expect to occur in the absence of an ability to maintain two-way communications during the trans- and post-attack period?

General ELLIS. Senator, once deterrence has failed and we execute our forces the conflict environment changes—rapidly and drastically. [Deleted.]

SCT ON GPS DECISION

Senator WARNER. Is the decision [deleted] undergoing review by the Reagan Administration?

Answer. No, at this time we are not re-evaluating that decision.

SCT

Senator WARNER. What would be the cost of pursuing this option and what would be the unique contribution [deleted]?

General ELLIS. [Deleted.]

Senator WARNER. General Ellis, as an operational commander, what importance do you attach to acquiring this added capability? Would you prefer to see the resources required invested in developing and acquiring some alternative capability?

General ELLIS. Senator [deleted].

Senator WARNER. General Ellis, in your personal opinion, do you feel that the original 24 satellite GPS constellation is militarily required for EAM distribution, assuming SCTs were to be deployed on board?

Senator WARNER. Senator, deployment of a 24-satellite GPS constellation would have several military benefits. However, incorporation of Single Channel Transponders on GPS does not appear to provide sufficient additional capability to warrant the expense.

Senator WARNER. Dr. Van Trees, have tests of the OTH-B system now in operation in Maine validated this technology and cleared the way for expanded deployment of this system?

Dr. VAN TREES. The system performance tests of the Over-the-Horizon-Backscatter (OTH-B) experimental radar system in Maine have just been completed [deleted]. The data obtained, as well as relevant data obtained at other installations, has not yet been fully analyzed. [Deleted.] The capabilities and limitations of OTH-B radar will be evaluated this summer and will be reviewed at a DSARC late this year.

Senator WARNER. Dr. Van Trees, do you believe that the OTH technology will be able to surmount the difficulties currently being experienced in [deleted] missions.

Dr. VAN TREES. [Deleted.] One of the objectives of our current tests is to define the limits of acceptable operation at northern latitudes. The basic problem is that an OTH-B radar must utilize the ionosphere to refract energy and the ionosphere is frequently disturbed at high latitudes. [Deleted.]

Senator WARNER. Dr. Van Trees, what steps are being taken to provide dual phenomenology warning and attack assessment in the trans-attack period?

Dr. VAN TREES. [Deleted.]

Senator WARNER. Dr. Van Trees, does any capability exist or is any under development to provide a reconstitutable dual phenomenology capability following a strategic attack?

Dr. VAN TREES. [Deleted.]

DSCS III

Senator WARNER. Dr. Van Trees and General Ellis, how urgent a priority is the block upgrading of the DSCS satellite system to give it Phase III characteristics?

General ELLIS. Mr. Chairman, it is very important because of its potential to improve strategic connectivity. [Deleted.]

Dr. VAN TREES. The first launch of DSCS III satellite is presently scheduled for late June 1981. This is the Demonstration Flight Satellite number one (DFS-1) built as part of the DSCS III R&D program. Assuming everything will test out correctly with DFS-1, a second R&D Phase III satellite, DFS-2 which is a carbon copy of DFS-1, will be launched approximately one year later in June 1982. In June 1983, the third DSCS III satellite, which is the refurbished qualification model and again an exact replica of DFS-1 and DFS-2 will be launched. The highest DoD priority is to assure that the DSCS III satellite of the present design will be launched, operate properly and be available to assume the space segment responsibility for the DSCS in the late 1984, early 1985 time frame. This is a critical period based on present probability projections that the DSCS II satellites will have commenced full failure mode and will no longer be available to support communications requirements on a worldwide basis. While the first production buy of DSCS III satellites is scheduled for fiscal year 1982

they will be basically the same design as the DFS R&D satellites. However, there will be minor changes to these satellites to improve their performance and reliability. These changes will consist of the following: [Deleted.]

Add redundant Jammer Locator Electronics (JLE). Now that the initial design has been finalized and the actual satellite weight is known and the lift off weight capability of the Interim Upper Stage (IUS) is known, we can take advantage of the weight margin by adding redundant components.

Addition of a 10 watt solid state amplifier (SSA) as an additional redundant component in channel six of the DSCS III satellites. This 10 watt SSA will back up a 10 watt traveling wave tube amplifier (TWTA) to test out the SSA on orbit reliability. The projected reliability of the SSA greatly exceeds that of the TWTA's but whole scale change-out to SSAs will not take place until on-orbit testing proves out the projected reliability. Other changes will also be required at the time we change to all SSAs in the 10 watt channels. [Deleted.]

All the above planned changes have little if any risk associated with their implementation. They were not added to the R&D satellites because that would have impacted the schedule of the R&D phase. However, these changes are not considered block changes because they are not changing the operating characteristics of the satellite. Any block upgrading of the DSCS III satellites is projected for the outyears.

DIFFERENCES BETWEEN THE DSCS II AND DSCS III

Senator WARNER. What would you expect the differences between the DSCS II and DSCS III configurations to translate into terms of survivability, resistance to jamming and other performance measures?

Dr. VAN TREES. Survivability. [Deleted.]

Resistance to Jamming. [Deleted.]

General ELLIS. Senator, DSCS III satellites have been designed for [deleted].

DSCS III ACCELERATING

Senator WARNER. Is there any possibility of accelerating DSCS III upgrading? What would be the attendant cost of such an acceleration?

General ELLIS. Senator, it is not practical at this time to accelerate the Defense Satellite Communication System III schedule. [Deleted.]

Dr. VAN TREES. Accelerating DSCS III upgrading beyond our current initiatives is not practical. Our existing production planning already assumes an accelerated schedule through the use of advance buy parts and multiple manpower shifts during assembly, integration, and system tests.

Senator WARNER. Dr. Van Trees, where do we stand on the Mosaic Sensor Program at this time?

Has its technological promise moved closer toward realization?

To what degree is additional funding necessary or desirable to move this program closer to the point where we could make a sound decision about its ability to realize its promise?

Do alternative technologies appear to offer improved capabilities with lower technical risk, reduced investment or nearer IOC?

Dr. VAN TREES. The Air Force and Defense Advanced Research Project Agency have been negotiating a Joint Technology Development Program plan in response to the direction in the 15 February 1980 Secretary of Defense Decision Memorandum. Technology efforts [deleted] are being funded to support the mosaic sensor program. In addition, the Air Force has issued direction to Space Division to proceed with program architectural studies [deleted].

Funding during the fiscal year 1981 and 1985 time period of \$200 million is required to (1) complete technology work, (2) accomplish design and analysis efforts, (3) conduct ground tests using flight type hardware, and (4) develop system specifications and costs.

[Deleted.]

QUESTION SUBMITTED BY SENATOR SAM NUNN

Senator NUNN. Dr. Van Trees, how does the uncertainty surrounding the space shuttle schedule affect your plans into the next five years?

Dr. VAN TREES. While there has been uncertainty in the date for the first Space Shuttle launch and in the operational availability of the Space Shuttle. I am

confident that our critical launch needs are protected. A recent review of the Space Shuttle manifest by the Aeronautics and Astronautics Coordinating Board confirmed that all DOD launch requirements through fiscal year 1985 will be met, even if the total number of shuttle flights through 1985 is reduced from 48 to 32 due to NASA budget reductions. This includes our [deleted]. This reduced shuttle manifest (32) missions also supports launch of the three other DOD missions [deleted], which are not backed up. As protection against further delays in the Space Shuttle development or extensive grounding of the orbiter fleet during the early shuttle flights, DOD maintains an austere pool of Titan III (34)D backup vehicles. We are continuously evaluating the status of the Space Shuttle development and its projected ability to support our operational launch requirements against the adequacy of our expendable launch vehicle backup planning. Our current philosophy is to provide Titan III backup to critical DOD shuttle missions for two years after Shuttle IOC at the Kennedy Space Center and one year after IOC at Vandenberg AFB. An integral part of our backup philosophy is the maintenance of critical Titan III production capability until the shuttle is operational at the Kennedy Space Center. Maintaining this production capability assures our ability to procure additional Titan III vehicles if required.

Appropriated funding through fiscal year 1981 provided an austere pool of seven Titan III (34)D backup vehicles. However, delays in the space shuttle development and the impact of modifying one satellite forced us to reassign two of these backups to serve as prime launch vehicles for two critical DOD missions. This reduced our total number of backup Titan III (34)D vehicles to five.

As was noted in testimony on the fiscal year 1981 budget, the funds appropriated through fiscal year 1981 for backup Titan III (34)D launch vehicles only maintain critical Titan III production capability until September 1981. After the fiscal year 1981 President's Budget was submitted to the Congress and before action was completed on our fiscal year 1980 space boosters reprogramming request, the Space Shuttle IOC was delayed until September 1982. This opened a gap of one year between when critical Titan III production capability would be lost and when the Space Shuttle would be operational. Our fiscal year 1981 Supplemental Request, fiscal year 1982 Budget Request, and fiscal year 1983 program close this gap and maintain this critical production capability past the current Shuttle IOC backup vehicles. This would bring our total backups to seven again.

This combination of backup launch vehicles, maintenance of critical Titan III production capability, and availability of some number of Shuttle flights assures our ability to launch our critical missions.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

Senator LEVIN. Dr. Van Trees and Dr. Fossum, what is the potential of blue-green laser as an operational communication system both for Strategic and Tactical forces? What is the earliest the technology would be available to launch at least a prototype system? Is the funding for fiscal year 1983 adequate to support such a schedule?

Dr. FOSSUM. The Strategic Laser Communication (SLC) concept offers the potential for providing communications, using blue-green lasers, to submarines at operational depths in a variety of missions. [Deleted.]

The currently funded SLC program is a technology effort [deleted.] There is, however, the possibility of an aggressive program which pursues a vigorous risk-reduction technology program [deleted.] Funding has not been identified to support this aggressive program, and the current fiscal year 1981 to fiscal year 1983 budget of \$20.8M, \$20.2M, and \$31.2M would have to be increased to \$28.7M, \$46.3M and \$67.5M respectively. Total program costs to fiscal year 1987 would be about \$380M instead of the current \$191M.

Tactical and strategic applications [deleted] could be based on near state-of-the-art technology. [Deleted.] Prototyping could conceivably occur in 1984, with an IOC 2 to 3 years later.

Dr. VAN TREES. The Strategic Laser Communications concept offers the potential for providing communications using blue-green lasers. [deleted.]

The currently funded SLC program is a technology effort. [Deleted.]

Senator LEVIN. Dr. Van Trees, to support your concerns that this country improve its survivable strategic C³ systems for the trans and post-attack periods,

you have quoted the Chief of Naval Operations, Admiral Hayward, who said, "In my judgment, there is nothing more important in our entire strategic modernization efforts ongoing today than correcting the enduring C³ problem. [Deleted] unless we are committed to solving C³ endurability."

Would you agree that the definition of "enduring" or of "endurability" means that the communication systems should be able to survive a nuclear attack and be available during and after the initial attack to be able to issue Emergency Action Message execution orders and force retargeting and reconstruction orders?

Dr. VAN TREES. I would certainly agree that the functional capability to communicate with the strategic forces must survive and endure [deleted.]

Senator LEVIN. Will the Navy's proposed ELF communications system be able to survive a direct attack and be able to provide the high data rates required for transmitting Emergency Action Messages and other communications with our strategic forces, such as retargeting and reconstitution. Dr. Van Trees?

Dr. VAN TREES. The proposed austere ELF Communications System is a "soft" system and would not be able to survive a direct attack. The present data rate is [deleted.]

Senator LEVIN. Dr. Van Trees, you make a strong point that the new Strategic Force Employment Doctrine embodied in Presidential Directive 59 (PD-59) imposes requirements on our present strategic C³ system [deleted.]

Because of its low data rates and non-existent survivability, the Navy's proposed ELF system does not meet these new requirements imposed by PD-59 to support our strategic deterrence doctrine, would you not agree?

Dr. VAN TREES. The PD-59 requirements for [deleted.] The ELF system will provide a currently unavailable capability to communicate to our submarines when they are at operational depths and speeds, without subjecting them to the constraint of having to deploy an antenna at or near the surface.

Hence, the ELF communications system will contribute to deterrence by improving connectivity to the submarine forces on a day-to-day basis. Those forces will be able to receive short messages while retaining the operational flexibility needed to evade detection prior to attack and assure survivability. [Deleted.]

Senator LEVIN. Dr. Van Trees, if the Chief of Naval Operations is willing [deleted] until there is commitment to our solving the "enduring" C³ problem, which requires developing survivable communications systems, why should we spend money for a much lower priority project to build a nonsurvivable ELF system such as the one now proposed by the Navy?

Dr. VAN TREES. The ELF system is one of several elements of a strategic communications system. No one element can provide the total degree of hardness, redundancy and reconstitutability essential for pre-, trans-, and post-attack command and control of strategic forces. ELF could provide a unique, and currently unavailable, capability to communicate to our submarines at operational depths and speeds without the constraints of near-surface antennas. This would contribute to sustaining the survivability of the submarine forces by reducing the potential for their detection. The ELF system, [deleted.]

Senator LEVIN. Dr. Van Trees, in your remarks to the subcommittee, you stated that the Strategic Laser Communications (SLC), or Blue-Green Laser System, would be available after 1990, and that one reason it was not a competitor for the ELF system was because "we can achieve ELF in [deleted]."

Is it not true that the Navy's present estimates for deployment of the ELF system show it reaching only initial operational capability (IOC) sometime between [deleted] and achieving full operational capability no earlier than [deleted].

Dr. VAN TREES. The proposed milestones for the ELF Communications Program show an IOC in fiscal year [deleted] and an FOC in fiscal year [deleted].

Senator LEVIN. Dr. Van Trees, I have been informed by Defense Department scientists that a Strategic Laser Communications System actually could become operational in a limited capacity in either [deleted] with achievement of a capability equal to the proposed ELF system in [deleted], and with a capability much greater than ELF in terms of data rates and Emergency Action Message capabilities only [deleted].

Would not a Strategic Laser Communications system be much more survivable than an ELF system since it could rely on laser uplinks carried in aircraft and laser downlinks directed from satellites, and much more capable than ELF since it would impose [deleted].

Dr. VAN TREES. As I have indicated elsewhere in my testimony, there is every reason to believe that satellites can be made [deleted]. SLC satellites can be

placed in such high altitude orbits, and could be made further resistant to potential threats through [deleted]. We feel that if the technology proves successful, an SLC system could be made very survivable. [Deleted.]

ELF is not designed to survive a direct attack on the United States, although survivable or reconstitutable low-data rate ELF systems could be constructed. ELF, which is based on proven technology could be built now with very little risk and offers capabilities substantially different from those of SLC. ELF, in fact, goes a long way toward removing operational restrictions from submarines [deleted] and therefore helps insure the continuing survivability of SSBNs. SLC offers the same capability and more, but is further off and not proven.

Senator LEVIN. I understand that there has been significant progress made in the past year in the R&D on the SLC system in several key areas [deleted].

Is this correct, and could you provide for the record full details of all the important milestones achieved during the past year, Dr. Van Trees?

Dr. VAN TREES. There has been significant progress in the SLC technology program in the past year. The principal reason for this is that for the first time funding has been provided above the critical level so that many of the critical technologies can be advanced efficiently.

While the full power needed for a ground-based laser has not yet been demonstrated, many of the critical elements of such a laser have been demonstrated in the past year, including conversion of ultra-violet laser light to blue-green with conversion efficiencies of [deleted] and initial beam quality measurements. Near term milestones include narrow band blue-green operation and operation of a [deleted]. This laser could then be used to provide [deleted]. Issues of reliability, continuous operations, etc., are also being addressed in the SLC technology program.

Two different types of space-based lasers for SLC are being developed in a competitive effort. The current goal is single pulse operation [deleted] by April of this year. Preliminary results are extremely encouraging. Repped operation of a mercury bromide blue-green laser was achieved by the Navy at NOSC.

Compensation of a laser beam for atmospheric turbulence has been [deleted]. The ability to keep a laser beam narrow through the atmosphere and into space is mandatory for the ground-based approach to SLC, and this experiment clearly demonstrates the feasibility. Further efforts include taking the equipment into the field to demonstrate compensation of a low-power beam through the actual atmosphere.

Conceptual designs for a first SLC SAT have been worked out in the past few months. The space mirror and beacon satellite designs were based on existing technologies leading us to believe that a 1986 end-to-end feasibility experiment would be possible if approved. Remote sensing of water conditions has been demonstrated on Scripps, where scientists have devised a means of deriving ocean water opacities from NIMBUS-7 satellite data. This has been validated by measurements from surface ships with better than 98 percent correlation. Remote sensing of water types can be used to adaptively control the scanning of a SLC SAT to gain 13-16 db of system performance improvement.

Finally, a first generation submarine SLC receiver has been completed for the aircraft-to-submarine communications experiment this spring. This receiver has a [deleted] aperture. The technology used in this receiver is being scaled to an operational-type receiver system which will be available for experiments in 1983-84, and could be used to support airborne tactical applications of blue-green laser communications.

Senator WARNER. The subcommittee is adjourned.

[Whereupon, at 12:23 p.m., the hearing was adjourned subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, MARCH 11, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

AIR-BREATHING LEG OF THE STRATEGIC TRIAD

The subcommittee met in executive session, at 8:45 a.m., pursuant to notice, in room 224, Russell Senate Office Building, Senator John W. Warner, chairman, presiding.

Present: Senators Warner, Thurmond, Nunn, and Exon.

Staff present: Rhett B. Dawson, staff director; Francis J. Sullivan, minority staff director; Frank J. Gaffney, Edward B. Kenney, Ronald F. Lehman, E. George Riedel, and James C. Smith, professional staff members; Marie Fabrizio Dickinson, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Chris Lehman, assistant to Senator Warner; Jim Dykstra, assistant to Senator Cohen; Frank Krebs, assistant to Senator Cannon; Arnold Punaro, assistant to Senator Nunn; Greg Pallas, assistant to Senator Exon, and Willis Smith, assistant to Senator Jackson.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee will come to order.

There being no objection the subcommittee will go into executive session for national security reasons.

Today the Subcommittee on Strategic and Theater Nuclear Forces meets to hear testimony on modernization of our manned strategic bomber force. I am honored and pleased to welcome back to the subcommittee Gen. Lew Allen, Jr., Chief of Staff of the U.S. Air Force; Dr. Seymour L. Zeiberg, Deputy Under Secretary of Defense for Research and Engineering, Strategic and Space Systems; and Lt. Gen. Kelly H. Burke, Deputy Chief of Staff for Research, Development, and Acquisition.

B-52 AND FB-111 FORCES

Our discussions will address the status of our current B-52 and FB-111 forces, plans to upgrade those forces, bomber weapon programs such as the air-launched cruise missile, and an analysis of the factors governing selection of new manned strategic bombers.

The mainstay of our strategic bomber force is the aging B-52, a heavy bomber designed in the late 1940's, but extensively rebuilt and modernized since then. The high-flying supersonic successor to the B-52, the dart-like B-70, was canceled in the 1960's. Our strategic bomber forces were then supplemented by the low-flying FB-111, a medium bomber derived from the TFX fighter project.

The large B-52 bombers are now also trained to fly under the search patterns of Soviet radars and are being equipped with standoff air-launched cruise missiles. Despite an extensive and costly B-52 modernization program, concern remains that many of these slow-flying heavy bombers would be unable to escape their bases in the event of a Soviet SLBM attack, and this committee has received testimony that the United States cannot expect its B-52 and FB-111 aircraft to penetrate the Soviet air defenses after 1990.

Four years ago the United States had in production a new strategic manned penetrating bomber, the swing-wing supersonic low-flying B-1. Six B-1 aircraft were authorized and four actually built before the Carter administration canceled the program.

In explaining the decision to terminate B-1 production, then Defense Secretary Brown stressed doubts about the need for a strategic penetrating bomber, and presented a large-scale program to outfit B-52 bombers with long-range, air-launched cruise missiles. Nevertheless, bomber penetration test and evaluation continued using B-1 airframes and avionics.

STRATEGIC PROGRAM DELAYS

Delays in U.S. strategic programs such as the *Ohio*-class Trident submarine and the MX mobile ICBM combined with an increased Soviet threat which will soon make vulnerable our land-based strategic missile has made it imperative that the United States commit to strengthening each and every leg of the strategic Triad.

Last year the House of Representatives amended the fiscal year 1981 authorization bill to include funding for development and production of a strategic weapons launcher (SWL), a cruise missile carrying, fixed-wing variant of the B-1 bomber.

The Senate Armed Services Committee amended the authorization bill to provide development of stretched FB-111B/C aircraft, doubling the range/payload capability of existing FB-111A and FB-111B airframes. As a result of Senate floor action and the authorization conference report the Congress authorized \$300 million for development of a multirole manned bomber for both the conventional and strategic long-range mission. Candidate aircraft were the B-1, B-1 variants, stretched FB-111, and advanced technology options.

The President was directed to report back to the Congress with recommendations by March 15, just 4 days away. Secretary Weinberger, however, has told this committee in testimony that the new administration will not be able to make a recommendation by March 15 but will do so as soon as possible. Today, however, we shall receive testimony on the status of the new bomber study and the issues which it must address.

Studies by the Strategic Air Command indicate that a near-term bomber such as the B-1 or the FB-111B/C could significantly com-

press the time necessary for the United States to return to the strategic nuclear balance which existed in 1977. At the same time, however, former Secretary of Defense Harold Brown has suggested that the so-called stealth technology could be applied to an advanced technology strategic bomber which, if successful, would be available at a somewhat later date than the near-term bomber option.

Although modifying existing aircraft, as in the FB-111 stretch option, is the least costly approach, all of the bomber options which we are considering are very expensive.

Funding any of the bomber programs under consideration will place a major burden on the defense budget even with the large increases anticipated by the Reagan administration. Thus, with cost being a major consideration, the Congress must weigh carefully any steps to develop or procure new strategic bombers. We must decide whether or not the United States can afford both a near-term bomber program and an advanced technology bomber program. We must ask whether or not advanced technology will be good enough and near enough to justify not doing a near-term bomber. And we must ask whether or not we can justify proceeding with two bomber programs, all in the context of our other strategic programs such as the MX, the Trident II, and the air-launched cruise missile.

General Allen and Dr. Zeiberg and General Burke, we welcome you this morning.

Senator Thurmond, would you like to make a statement?

Senator THURMOND. I think I will wait. Thank you very much.

Senator WARNER. General Allen.

STATEMENTS OF GEN. LEW ALLEN, JR., CHIEF OF STAFF OF THE U.S. AIR FORCE; ACCOMPANIED BY LT. GEN. KELLY H. BURKE, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION; AND DR. SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS)

General ALLEN. Senator, we are pleased to be here. This is our second visit to you on the strategic programs, and the first dealt with the MX. I would like to make an introductory remark or two, and then I will turn the briefing over to General Burke, who will discuss with you the status of our bomber programs.

Before we began the meeting last time I took just a moment to discuss with you this subject of essential equivalence, and how we try to view that. I tried to describe to you why I was uncomfortable with public statements which alluded to the inferiority of the strategic forces. But in that discussion it seemed to me that I ran the risk of appearing overly optimistic in discussing the status of our strategic situation. The fact of the matter is that the strategic balance between the United States and Soviet Union is in very poor shape. It is a bad situation. It is better now than it will be in the future, which is not a good situation because it gets a great deal worse as we go into the future. The programs which we are attempting to bring in are not easy. None of them are cheap. But they are made extraordinarily important by the situation which is real and which is current.

I do not have a great deal of optimism about describing that future, about that situation either present or future, although certainly I am more concerned about the future than about the present.

It is the recognition of that unfavorable situation which has caused the Air Force within its own allocations of priorities to place at the top emphasis on strategic programs. We have done that consistently now for some years.

In the previous administration that meant, of course, the MX program as the top effort to redress the unfortunate situation that we have, and the ALCM programs on the B-52's since, of course, we were not previously allowed to consider or go forward with a new bomber program.

On those programs, the MX we have already discussed with you. I continued to regard that as our top priority program. We simply have to continue with redressing the vulnerability of the land-based leg of the Triad. We are here today to address the bomber leg.

We have placed the same emphasis in our programming on the ALCM program as with MX. That program is going well and there will be some descriptions of it today. The ALCM is new and it is good but it is a weapon for the B-52. It does not, in any long term or satisfactory way, address all of the problems we face in the aging of the B-52. It does extend the useful life of the B-52 and does allow us to have a period of time in which we are continuing to have to be able to deliver penetrating weapons, but the ALCM is not a panacea. It can be defended against, and there are concerns and shortcomings which we have in that.

SOVIET AIR DEFENSES

With regard to the Soviet air defenses, we have been forced to recognize that the Soviets have a history of an enormous investment in air defense. They take the defense of homeland very seriously, and those defenses have had some capability which we have surmounted by means of the various techniques which are available to us.

As we now look into the future, we project very major increased Soviet investment in that air defense, and considerable success in programs which we have watched carefully over the years. Those that will affect us in the bomber issues that we will discuss today are primarily the [deleted]. We are convinced that both of those will add significantly to the problem of bomber successfully penetrating as we move on through the eighties.

We are completely convinced that the proper policy for the United States is to preserve the balanced strength of the Triad as well as we are able. The Triad has been reasonably well balanced. It is imbalanced now because of degradation due to the vulnerability of the Minuteman force. We will hope to restore that through the MX program and return to a balanced system. Then we have to worry about the bombers.

The bombers are very important to the U.S. Triad; they have been historically. We have a significant fraction of our total SIOP weapons on the bombers in the alert status but a much larger fraction of the total weapons on the bombers in the fully generated status. It represents the swing of the U.S. forces between peacetime condi-

tions and crisis conditions. A very large portion of the megatonnage of U.S. forces in the generated case resides on the bombers. At least that is true at the present time. In addition, nonprompt hard target kill is important and a significant fraction of our hard target kill capability resides in the bombers.

As the situation moves into the future and the ICBM's become less effective before their survivability is restored, the bombers will be carrying even a larger portion of that role. We believe that we must address, and address quickly, the issues with respect to maintaining the strength of that bomber force, both for the remainder of this decade and on out into the 1990's. The difficulties we have that cause the kinds of problems which you see now, and which we will see in the future are, in large measure, caused by the necessity to meet a situation which is difficult in the short term and even more difficult in the long term. The difficulty comes in trying to provide a reasonable balance between the efforts that are required in meeting both the near-term and the long-term threat.

U.S. STRATEGIC FORCES

Now, I would like to make one other point with respect to bombers before we begin describing the programs. That is, my remarks so far have dealt with what, in fact, we consider to be the most serious issue facing the United States. That is the balance of central strategic forces. We discussed the role that the bombers primarily serve at the present time, and that is the attack of fixed precisely known targets within the Soviet Union. But there is little question in our mind that U.S. policy and strategy has been evolving rapidly to the desire to have a broader range of war fighting capabilities. In particular that means that we want to extend the capability of the U.S. strategic forces to attack [deleted].

One of the first things that comes to mind in that regard is Soviet forces [deleted].

In the same way, as you know, the Soviets place emphasis on such things as [deleted]. Even though we are skeptical about that as part of the inevitable requirement to move toward war fighting capability, we also will look more in the future at [deleted]. And again the bombers play a very special role in that regard. As we go into the future, manned bombers will add that capability uniquely in the force.

Now, the next point is that history has shown us that in the nuclear era the ability of a bomber to change from a fairly low peacetime rate of alert to a high status of generated alert has had a very major effect on the Soviet Union in times of crisis. It demonstrates U.S. resolve in a very strong way. We have, of course, as you know, in some cases extended that to some measure of airborne alert and again impressed the Soviets with the determination that we felt.

In previous years we went so far as to deploy those forces forward to impress the Soviets with the fact that we were prepared to attack if that were required. Today, the thing that comes up in addition to these nuclear capabilities is the capability of the bomber in a conventional war. We have, in fact, used our strategic bombers in all of the conventional wars that we have fought, either directly as we did in Korea and Vietnam, or as a show of force as we have done in many other conflicts and crises.

They represent today in Southwest Asia, limited though it is, one of the ways in which we have demonstrated our ability to get weapons, nuclear or nonnuclear, into that area in spite of the base limitations that face us. We have flown B-52's, as you know, from a long way away, from Guam, typically, on a very long flight, but we have flown them, nevertheless, to the Arabian Sea. We have flown them on sea surveillance missions but there is no question in the minds of the Soviets, who observed all of that very carefully, that those bombers were demonstrating a capability to strike forces in that area if they were required to do so.

ENHANCED BOMBER CAPABILITIES

We will discuss today the fact that we are enhancing that capability by giving a greater conventional bomb-carrying capability to those bombers. We think that is an important endeavor and one that we have not yet pushed as hard as we should.

We have not been able to support it to the extent that SAC believes, correctly I think, that we should. So as we discuss some of these problems, I wanted to leave you with a couple of conclusions that the Air Force has: First of all the strategic balance between the United States and Soviet Union is not good now, and it is getting worse. It will turn around to some degree as we introduce programs—introduce the MX—and it will be maintained and not improved a lot by deployment of the ALCM, and it needs both prompt and long-term addressal.

That is, the emphasis of improving our bomber capability is the most important thing that the Air Force has on its plate. That is, we assign it top priority. Even though we recognize the very serious deficiencies we have in our general purpose forces, we have consistently applied the top priority in funding applications to these programs.

Although in the Carter fiscal year 1982 budget we were able to provide the support such that MX was fully funded and ALCM was fully funded, we were not able to fund other things we wanted and, in particular, a bomber program. But the anticipated growth which the present administration plans in out-year funding does give us the room to get that program in there. Therefore, it certainly continues to be a matter of high priority and one we believe we can accommodate within total priorities that the Air Force has to do, to introduce a bomber program as urgently needed into our strategic forces.

We believe that this bomber program, when introduced, has to have the characteristics of being a large airplane, having a very long range, and having the capability of doing the fixed target SIOP, the imprecisely located target and the conventional roles.

We think that all of those missions are very significant. We will consider, in addition, the ability to serve as an ALCM carrier. But the multiple role characteristic of that bomber is to us a very important rule which we follow in addressing the options that come before us.

Lastly, we are convinced that with regard to the bomber, as with regard to the broader issue of strategic forces, there are near term questions and there are far term questions. It clearly makes our life difficult in realizing that whereas we are driven by a great sense of urgency to improve the unfavorable strategic situation, we at the same time recognize that developments and advancements which we

make decisions on now are ones that we will have to live with well through the 1990's.

All of our investments in bombers would clearly be expected to have a life of 20 years or more, and therefore we are looking at a long-range situation, even though we couple it on the front end with a great sense of urgency. That balance is complex. During that time we fully anticipate very major changes in Soviet defensive capability, and those must be taken into account.

Senator, with those remarks I would like to have General Burke proceed.

Senator WARNER. Do you have any questions?

Senator THURMOND. I have a few now before we get into specific programs.

General Allen, the Reagan administration has recommended a large increase in defense with which I heartily agree. I remember giving questions to you and another member of the Joint Chiefs the year before last, and at that time it was stated that the Soviets were ahead of us in conventional weapons and during the year 1980 they would surpass us in strategic nuclear weapons.

As I understand that has occurred and they are ahead of us now in both fields.

Is that correct?

STRATEGIC NUCLEAR BALANCE

General ALLEN. I find it very difficult to address the strategic nuclear balance between the United States and Soviet Union in just a single word. I tried to find a descriptive word a few moments ago which conveys my judgment that the situation is very bad and it is getting worse. That is correct, sir, we did predict this situation would be occurring about this time. It is certainly occurring.

Senator THURMOND. I have been very concerned about the proposition to deploy the MX missile in several States, using all of that area and inconveniencing the lives of so many people and costing such an enormous amount.

Some people have suggested that the cheapest way to do this would be to put them under water. In that case you wouldn't have the Triad, you would have a Dyad. You would just have air and sea.

Is the Air Force still of the opinion that the safest thing for this country to do is to continue with the MX missile as it has been contemplated, deployed in several States, or are you now considering reevaluating it?

General ALLEN. No, sir, the Air Force remains committed to a deployment system which is basically a multiple protective shelter, land-based arrangement. We are convinced from a great deal of study that that is the best deployment arrangement. We are re-examining MX basing modes at the direction of the Secretary of Defense, and we will present whatever technical modifications can be made to that scheme that will reduce its cost and make it more environmentally compatible with the areas.

But although we will reexamine them, we are convinced that the sea-based systems are not the best course. We are convinced that air-basing the MX missile, which we looked at before, is not a cost-

effective thing to do. We have similar concerns about a roadmobile or railmobile system. Although all of these are possible, as we weigh them, they don't seem to us to be the best. So we remain convinced that the deployment scheme we have underway is the best and we continue to support that very, very vigorously.

MX MISSILE SYSTEM DEVELOPMENT

Senator THURMOND. As time passes, conditions change and the threat changes and new weapons have to be developed. How many years would it take to build the MX missile system completely?

General ALLEN. Its deployment, initial capability begins in about 1986 and the deployment is completed in 1989.

Senator THURMOND. This is now 1981. That is 8 years away. In 8 years time so many things could change. We are spending billions and billions of dollars, and it does concern me.

I have backed the MX and probably will continue to back it the best way I can. The Defense Department feels it is the best thing to do and I presume you have considered every facet of it, as to the best course to pursue.

General ALLEN. We try very hard, and, of course, we worry very much about the points you are making, that is, that it is late and that the threat changes.

There are two things one can plan. One being that in some way we can delay it or start over again in order to address some of these concerns and I am absolutely convinced that would make the situation worse. The solution that I would much prefer is that we would not be in this situation today had we moved out much more vigorously on the matter 3 or 4 years ago. If we had, those times would not have been as bad as you are describing.

Senator THURMOND. We don't know what course things will take, but the Soviets, if they follow their past course, will continue to try to spread their aggression throughout the world. I don't see any change in their policy, do you?

General ALLEN. No, sir. I think I do see a change, and the change is that because of the favorable strategic nuclear balance which they will see, Soviet confidence in their ability to be provocative in these aggressive acts will increase, and therefore we will see more of these provocative aggressions.

Senator THURMOND. They will increase instead of decrease, you think?

General ALLEN. Yes.

Senator THURMOND. Thank you very much.

Senator WARNER. Thank you, Senator Thurmond.

TRIAD CONCEPT

General Allen, each year we have to put back into the record some basics that we have covered before, and my colleagues have asked certain general questions anticipating that in floor debate they will be raised again and, consequently, I do want to strengthen the record.

First let's go back to the genesis of the Triad concept, which I personally support thoroughly. Nevertheless, there is a considerable disparity in how the Soviet Union fashioned its traditional forces in

placing greater emphasis on the land-based leg versus the air-breathing based, and since the program we are addressing today is the air-breathing based I could be asked a question, "Why don't we go more into the pattern of the Soviet Union?" And let's plug that gap in the record now.

General ALLEN. The United States has, for all of the years of nuclear forces, placed emphasis on having survivability of forces, whose role was deterrence through the ability to achieve unacceptable damage within the Soviet Union—no matter what kind of attack the Soviets would choose to place upon the United States.

That basic concept has been modified over the years to include more of what now has come to be called war fighting concepts but it is still the same basic idea, to insure that at every level of conflict our forces are configured in such a way that the Soviets have no incentive to attack.

Now, the problem of all of this business of a strategic balance which I tried to address again this morning, the one that I think worries me the most, is not exactly the balance but it is the asymmetry that you mentioned. It is the fact that we do not have the same views on this matter, and one has to ask why.

I am not sure I fully know the answer. I am worried about the fact that the Soviets, in fact, have a view of first strike attack and that they are less concerned about the survivability of their forces, and less concerned about attack from the United States, and more concerned about the coercive value of a very strong counterforce capability.

That is a destabilizing characteristic. It is a matter which the United States should be very concerned about. It is not, I don't believe, a characteristic of forces that we should choose to emulate but it is one that we should choose to spend a great deal of effort in balancing.

Senator WARNER. That is a clear answer.

We talked in general terms this morning about your characterization of the imbalance, and you interjected a word or two here this morning that is new in your litany. Let's be a little more precise with respect to dates. You used the term that you would feel more comfortable after we introduce the new systems, and we talked about the IOC in response to Senator Thurmond's question of a program first becoming operational in 1988 or 1989. Isn't that right, for the MX?

General ALLEN. Yes; in the period between that time.

BOMBER AND MX TIME FRAME

Senator WARNER. I am trying to weave together your words and it would lead us to believe that we are therefore in a state of imbalance through 1989, with respect to that one program. We are looking at two programs, the bomber and the MX, so let's address the time frame using assumptions of MX IOC of 1988 and 1989, and bomber IOC of about the same time frame, or a little earlier, wouldn't I be correct in that?

General ALLEN. Yes.

Senator WARNER. What would be the IOC for the bomber?

General ALLEN. Well, the Congress has asked us, of course, to look at an IOC of 1987 and that is achievable.

Senator WARNER. You are going to testify this morning it is achievable?

General ALLEN. Yes.

Senator WARNER. The bomber IOC is 1989 and MX 1988 and 1989, and now back again to the question of the imbalance, when do we begin to have some corrective measures here, in other words, in this imbalance?

General ALLEN. The IOC on MX is 1986. We will discuss several possible IOC's on bomber forces since there are some that have an earlier date. It is 1985 that would be possible in one of the versions.

Senator WARNER. Didn't I hear correctly in response to my question, you are talking about full operational achievability in 1986?

General ALLEN. No; I was referring to initial operating capabilities. The problem we have in all of these things is assuring the right measures of strategic equivalence. But in general we have accepted descriptions which include various counterforce kinds of measures, and even though they are of somewhat lesser importance to us, it is not altogether clear that those are not of the greatest importance to the Soviet Union since they have constructed their forces in a way that gives them a strong counterforce capability.

When we look at those measures of counterforce, we end up concluding that the well used strategic bathtub exists and the turnaround of that bathtub is consistent with the introduction of MX so it is in fairly good shape then in a 1988 time frame. It will get back in shape about that time.

Now, there are two things that need to be said. The first one is that there is always difficulty in drawing these things too fine. The second one, I think is a little bit more worrisome, and that is that all of these estimates have been made against last year's NIE, against what is known as the moderate threat within SALT II treaty limits, but there is also a broader expectation of Soviet programs if they were not limited by SALT II.

Now that is not terribly critical in the near years because those estimates in fact don't change much even if there is not a SALT II treaty. They remain about the same. About the middle of the 1980's you have to worry about a Soviet breakout. That is the Soviets have production capabilities in several of their weapons systems which if they would choose to emphasize them, could cause us even more difficulty than that. My own view is that it is not very helpful to cry alarm about that or to greatly change the objectives which we have in mind, but only to be even more determined and resolute that we move along toward the objectives we have set out and recognize all along, that even those objectives may be insufficient to meet the full threat the Soviets may pose.

Senator WARNER. They have a number of hot lines open now, and they have a wider range of R. & D. in systems, and should they suddenly decide to go to an all out effort this bathtub gets a little deeper.

General ALLEN. Yes, sir.

Senator WARNER. You used the phrase, "We are going to consider the ALCM in the context of the new bomber." I thought it was stronger than that, that ALCM was an essential feature of any new air-breathing bomber, as an ALCM carrier.

General ALLEN. We have not regarded it as essential. We have regarded it as important. Some of the designs, and I think General Burke will get into this, are more compatible with being an ALCM standoff carrier than others. For example, the FB-111 would not be a very good ALCM carrier.

Senator WARNER. But absent the FB-111, then, we are going to discuss variants today which would not carry ALCM, is that correct?

General BURKE. Yes, sir, anything other than the FB-111 would be that.

Senator WARNER. Any design will be compatible with ALCM?

General BURKE. Yes.

Senator WARNER. Let me just correct that. Now you will discuss the standoff capability, the penetrator. In any case, a B-1 variant will be a penetrator.

General BURKE. Yes, sir, all of the variants being looked at are penetrators and all have ALCM capability.

Senator WARNER. And General Allen, you were frank to say that in your vast knowledge on this subject you really don't know why the Soviets placed a greater emphasis on the land-based versus the air? That is just an unknown in history and is likely to have something to do with their perspective of first strike and first deterrent?

General ALLEN. Yes; that is right.

Senator WARNER. I think we are ready now to proceed.

STATEMENT OF LT. GEN. KELLY H. BURKE, USAF, DEPUTY CHIEF OF STAFF FOR R.D. & A., U.S. AIR FORCE

General BURKE. This morning I would like to discuss with the subcommittee the bomber leg of our strategic Triad, the components that make up that leg, and with specific attention to the programs that are included in the 1982 budget for that leg of the Triad.

I would like to spend just a few minutes talking about the forces that we have today, Senator, since this is this subcommittee's first hearings on the bomber leg. I think it would be worthwhile to review where we are before we talk about what we are proposing to do to modernize those forces and conclude with some talk about the joint bomber study, and where we stand with that and when we expect to report to you on that.

To look at the penetrating bombers first, we have three versions of the B-52 and the FB-111. We have in total 347 B-52's left in the inventory.

Senator THURMOND. What condition are they in now? Are they ready to go?

B-52'S ON ALERT

General BURKE. Yes, sir. [Deleted] percent of the B-52's are at this moment on alert with nuclear weapons, crews in readiness and could be launched in less than [deleted] minutes.

Senator THURMOND. What is the greatest weakness of the B-52? Is it the slowness in speed with which it travels or is it a lack of ability to carry a heavier load or just why do we need a new bomber?

General BURKE. It has an excellent range and payload capability, and we are not apt to improve on that in any significant way. It has a

huge radar cross-section. That is, it is visible to any radar, even low quality radars. It is like a barn door on a radar screen. That makes it extremely difficult to counter by electronic countermeasure tactics.

Senator THURMOND. If we built a new bomber, what features should be included that the B-52 doesn't have?

General BURKE. The primary features it should have are a means of successfully penetrating the sophisticated defense that the Soviet Union has and that many of their surrogates and client states have. The B-52 is still able to penetrate today but we think it will not be able to in any reasonable manner by the end of this decade.

Senator THURMOND. Thank you.

General BURKE. We have 347 of the B-52's in three categories, D, G, and H models and I will say a word about each. We have 62 of the FB-111's. That is our total bomber force. We built over 750 B-52's, so more than half have been retired or lost. The oldest in the inventory is the B-52D. We have 79 of those, 75 of which we call primary authorized aircraft, and first delivered in 1956. You may have heard that we have crew members flying B-52's that were born after the airplanes were built and that is literally true in some cases.

The B-52D carries four nuclear bombs and can carry an exceptionally large conventional bomb load of some 102 Mark-82 bombs. The B-52D has not received any modifications over the past 15 years to keep it up as a nuclear penetrator. It was not modified to carry the short-range attack missile and not modified to give it the electro-optical viewing system we put on the others to allow them to penetrate at lower altitudes and it has not received the electronic countermeasures upgrades. So it is our least capable SIOP airplane and hence we have to use it very selectively for that. On the other hand, it is the most capable conventional airplane in terms of carrying capability because we modified it to carry these bomb loads in Vietnam and it was the B-52D that carried the brunt of the bombing that took place in Vietnam.

The airplane that we have in largest number is the B-52G, 172 total, and we started receiving them in 1959. It does have the latest modifications to enhance its ability to penetrate defenses, and can carry [deleted] 4 nuclear bombs, plus six of the short-range attack missiles.

But notice that it can carry only a relatively small conventional load because it wasn't designed for that and it has not been modified for that, and I will get back to that point a little later.

We want to do something about that, not with the G but with the H, which is our newest airplane. It is about the same except it has a turbo-fan engine, the only B-52 that has turbo-fan engines and that gives it substantially better ranges and payload than the others. It is the newest. We took delivery in 1962. It carries the same load as the B-52G, very good for nuclear and not very good for conventional weapons.

The FB-111 you will recognize is a somewhat larger version of the tactical fighter. We have 62 of these. They are between 10 and 12 years old. They can carry up to four gravity bombs and two of the short-range attack missiles, [deleted] and for their size a fairly good conventional bomb load as well.

BOMBER FORCE BASING



All of our bombers are based on sovereign U.S. territory and I think that is a very desirable feature. The only one outside the Continental United States is the squadron we have at Andersen Air Force Base in Guam. The rest are spread across the country. The two F-111 bases we need to keep fairly far forward, and then the remaining bombers at B-52 bases.

Senator WARNER. Aren't some of them in England?

General BURKE. Those F-111's are tactical fighters and there are two wings, each with 72 aircraft in England, but they are tactical fighters, and not very much different from our FB-111's. That is more of a semantic distinction than a practical one.

Senator WARNER. Let me look at that for a minute. Seymour Johnson, would you identify that?

General BURKE. That is at Goldsboro, N.C.

Senator WARNER. It looks to be in Virginia. That is a mistake, is it?

General BURKE. Yes; the point is well taken.

Senator WARNER. Thank you.

General BURKE. Supporting the bomber force, and essential to that bomber force is our KC-135 refueling force which not only provides the fueling without which the bombers can't get to their targets, but also provides refueling for all of our tactical aircraft and a growing percentage of our airlift airplanes. It is a remarkable airplane. We bought them in quite large numbers and still have 642 in the inventory. They came to us between 1959 and 1962. The 707 is going to be the gooney bird of the jet age. It is going to stay around forever. We don't fly them very much, about 1 hour a day, whereas the airlines would fly them more like 10, and it is estimated the airplane is going to be struc-

turally worthy out past the year 2025. I am not sure there is going to be any fuel then but we will have an airplane to do it.

Further, and somewhat oddly, there has not been much change in the air refueling mission. If we were to build a new air refueling airplane today it would not look a whole lot different from the KC-135.

Senator WATNER. Your engine is a troublesome feature?

General BURKE. The engine is the trouble spot. It has the J57 engine, which is an early jet engine, and it is grossly fuel inefficient and also the noisiest and dirtiest engine flying today. We have these airplanes based in England and the British have been very quick to point out to us that this engine is noisier than the Concorde engine, which we were reluctant to have enter our airports here.

TANKER FORCE BASING

(ACTIVE)



Wherever we have bombers we have tankers. Since we have more tankers than bombers, we have bases in Grissom, Ind., and Kansas and Oklahoma that are pure tanker bases. So they are spread a little more. We have tankers in the Active Force and we have tankers in the Reserve Forces, both National Guard and Air Force Reserve, but they are all committed to the Strategic Air Command, Reserve and Active.

TANKER FORCE BASING

(AFR/ANG)



12

The Reserve Forces maintain day-to-day alert in these airplanes, just as do the Active Forces. 128 of them are in air Reserve units and scattered pretty much throughout the country. Here you will notice that a fair number of these are at civilian airfields—Milwaukee, Pittsburgh, Chicago, Knoxville, Salt Lake, and Phoenix and this exacerbates the noise and pollution problem.

Senator WARNER. What is the typical number of these bases?

General BURKE. There are eight. There are eight in Reserve units. Some of them are colocated with active units.

Senator WARNER. Senator Thurmond wanted to make sure there was a figure put in here on the savings. Have you categorized them to say the overhead cost of maintenance of this standby force vis-a-vis the overhead cost of a comparable number of airplanes?

General BURKE. I don't have that in mind but I will be happy to supply that for the record. We do operate very efficiently in the Reserve Forces and I might say they operate them very well. By and large we find that these Reserve units are well-trained and more experienced than the active duty units.

General ALLEN. We will give you a more accurate answer, but roughly it is 30 percent less expensive in the Guard units. That is discounted by the fact that for these tanker units you cannot maintain as high an alert rate as you can with the Active Forces. So when you consider alert forces you have to discount that by a different alert ratio.

[The information follows:]

COST SAVINGS/RESERVE AND GUARD TANKERS

According to a 1977 Rand study, the cost of operating an ANG aircraft squadron is approximately 70 percent of the Air Force cost of operating a similar squadron. That study was the last authoritative comparison of the cost between the ANG and Active units.

The primary ANG cost savings are in support costs. These arise from two primary causes. The first is that most ANG units operate out of civilian air fields. Many of the costs of operating a "base" are not, therefore, paid by the ANG or only paid on a pro-rated basis. For example, control towers, access roads, runways, and the like are shared with commercial operations. This significantly reduces our cost relative to the Air Force. The second factor is the part time nature of our military force. Because of this, we do not have to operate and staff hospitals, family housing, and other personnel support facilities.

Besides reduced support costs, the part time force and use of technicians reduces our requirement for full time manpower which further reduces our operating cost.

In terms of direct cost, an ANG KC-135 squadron cost will be at least equal or perhaps higher than an Active KC-135 unit. A slightly greater crew ratio 1.5 vice 1.27 in the ANG generates a higher flying hour program. This is more than offset, however, by the reduced support costs and the cost savings generated from part time manning.

Senator WARNER. And the crews in the Reserve are working in their civilian jobs and therefore they have greater response time to alert?

General ALLEN. Yes.

Senator WARNER. I am also interested in the maintenance problem as a factor of fewer hours of flight time for their particular aircraft. We can put that in the record if you wish.

I presume that your comparison of an 8-hour flight time for the standard unit in civilian aircraft vis-a-vis one in the military, shows greater maintenance problems for the military. Is that correct?

General BURKE. Yes; airplanes work best when they are flown regularly and often; that is a true statement. We spend a lot of time in maintenance in preparing airplanes to go on alert, where they sit for perhaps 4 weeks, putting on the right fuel load and right bomb load if they are bombers and all of that sort of thing; and then in deconfiguring it, so it can go out and fly a regular mission.

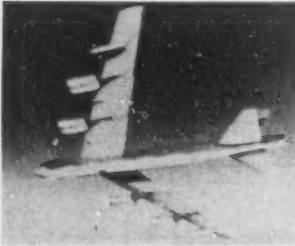
Senator WARNER. All right. Will you proceed?

General BURKE. Turning to the specifications of the B-52 modernization program, I would like to touch on several points. We talked about the age of the B-52's. An interesting comparison is that we retained B-47's for about 15 years before retiring them, and no other strategic bomber has remained in the U.S. inventory more than 10 years; and here we are talking well beyond 30 years for the B-52. So it is not surprising that there is a fair number of billions associated with updating and modifying the airplane to keep it going.

B-52 MODERNIZATION

PROGRAM SUMMARY

FY 82 RDT&E REQUEST
\$ 146.2M



- OAS/CMC/ALCM RELATED \$52.6M
- AIRCRAFT MODERNIZATION PROJECTS \$61.3M
- EMP \$26.3M
- SPF \$ 6.0M

FY 82 PROCUREMENT REQUEST
\$469.4M

- OAS/CMC \$324.5M
- ECM UPDATES \$ 28.8M
- AIRCRAFT MODERNIZATION PROGRAM \$ 31.7M
- AMAC \$ 12.3M
- RELIABILITY/MAINTAINABILITY MODS \$ 50.1M
- SPF \$ 22.0M

	FY 80 & PRIOR	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RD&E	220.6 M	120.2 M	146.2 M	CONT	CONTINUING	N/A
PROCUREMENT	567.7 M	477.6 M	469.4 M	CONT	CONTINUING	N/A

We are spending those kinds of moneys on the B-52. In the 1982 request there is \$146.2 million for research and development and nearly one-half billion dollars for the procurement. The biggest item by far is what we call the offensive avionics system, cruise-missile carriage and other modifications that are all necessary for the airplane to go into this missile-carrying role.

That research and development will be completed in 1982, but we will continue buying kits and modifying the airplanes for many years yet to come, and that is most of the budget.

Electronic countermeasures—we are completing some updates there, relatively modest ones. These types of modifications—I won't go into details—are all keeping the airplane flyable and healthy. There is a fairly constant level of effort to do what we call reliability and maintainability modifications. I did want to touch specifically on this, the SPF, Strategic Projection Force. General Allen alluded to this point; that is, we have an anomaly, in that the B-52D, the oldest and the least capable overall airplane, is the only B-52 that has been modified to carry the really large bomb loads. We think it makes eminently good sense to take the best airplanes [deleted] and modify some of them so that they can carry the big bomb loads and deliver them with some accuracy, [deleted] and [deleted]. And if we can do that, we can just bring a tremendous amount of firepower to bear. Each airplane carries a [deleted] bomb load.

The air-launched cruise missile program, the most important near-term improvement to the bomber leg of the Triad, has been moving on a very fast track. President Carter announced his decision not to produce the B-1 on June 30, 1977, and concurrent with that was a decision to accelerate the cruise missile development and procurement, so we have been proceeding, with considerable amounts of concurrency in the program. Yet, it has worked out, I think, quite well.

AIR LAUNCHED CRUISE MISSILE

STATUS

BOEING AGM-86B



FEB 78 - COMPETITIVE PROGRAM INITIATED

MAR 80 - SOURCE SELECTION

APR 80 - PRODUCTION DECISION

SEP 81 - FIRST ALERT CAPABILITY

DEC 82 - INITIAL OPERATIONAL CAPABILITY

OCT 85 - START INTERNAL CARRIAGE MOD

MAY 89 - LAST DELIVERY

We selected the Boeing candidate over the General Dynamics version in March, and made a production decision in April, and we expect to have our first capability to put these cruise missiles on alert this fall.

By the end of 1982 we expect to have a full squadron equipped with cruise missiles. Initially, our plans are to equip all of the B-52G's so that they can carry the cruise missile externally, while still continuing to carry the gravity bombs and the short-range attack missile internally. The idea is that during that period of time they would proceed out and launch their cruise missiles and then continue on as penetrators, using the SRAM and the gravity weapons as well.

By the mid-1980's we will produce enough cruise missiles that we can then come back and start modifying B-52's for internal cruise missile carriage as well. When that is completed, the B-52G will carry 20 cruise missiles, 6 under each wing and 8 in the bomb bay, and they will at that time become purely standoff cruise-missile carriers and no longer have a penetration role.

Additionally, we are doing the research and development which will permit us to also modify [deleted] and I think that is a very likely decision. So, by 1989 or the end of this decade all of the B-52G's [deleted] very likely will be standoff missile carriers.

Senator WARNER. Senator Exon, we welcome you. If you have questions, feel free to interject them.

Senator Exon. Thank you.

General BURKE. We were just talking about this, and I think you are familiar with that from Omaha days, and now we are talking about the modernization efforts to update the existing B-52's.

Senator WARNER. Senator Nunn, anytime you wish to ask questions, feel free to do so.

Senator NUNN. Thank you, Mr. Chairman.

General BURKE. The scheduled deployment of the air-launched cruise missile that I mentioned, our first squadron operational capability is at the end of 1982 and that is to be at Griffiss Air Force Base in upstate New York. Wurtsmith in Michigan is next, and then across to Grand Forks in North Dakota, and Fairchild in Washington State, and in Arkansas, and Carswell at Fort Worth, and Shreveport. The very last unit is Castle in California. That is our training unit; it does not maintain a daily alert force.

ALCM FLYOFF TEST

We conducted a competitive flyoff test which gave us sufficient data to make a selection between the two competing cruise-missile candidates, the Boeing version and the GD version. As soon as a production decision was made and as soon as we started receiving production missiles, we moved into a follow-on test and evaluation program of the production vehicles.

AIR LAUNCHED CRUISE MISSILE

— FOLLOW-ON TEST & EVALUATION PROGRAM —

19 FLIGHT PROGRAM

VERIFY RELIABILITY, ASSESS PERFORMANCE AND SURVIVABILITY AND
VERIFY ALCM/B-52 AVIONICS SYSTEMS INTERFACE

MSN #	SUCCESSFUL	FAILURE	REMARKS
1	X		
2	X		
3		X	ENGINE FAILURE CAUSE FOUND AND FIXED INCORPORATED IN PROD MISSILE
4	X		
5	X		
6		X	WINGS AND TAIL SURFACES DID NOT DEPLOY - CAUSE UNKNOWN
7		X	PREMATURE ENGINE SHUTDOWN ELECTRONIC FUEL CONTROL PROBLEM

18

We were planning 19 flights and we may well add to that. So far we have had seven, and as this schedule depicts, it has not gone that well. We have had three failures. The first had to do with a carbon buildup in the engine, and that problem was isolated and it has been

corrected and we don't expect any recurrence of that. The second failure, we suspect, was a human error. The missile just didn't activate at all; it was a low-level launch from [deleted] off the water and it just dropped in the water. The third is still under investigation. That is not really atypical for early stages of a program such as this. On the other hand, we don't want to be sanguine about that; it is not very encouraging.

Air Force Systems Command, under the leadership of Gen. Tom Marsh, has appointed an investigating group and they are going in and will look at all of that in detail. I think we will find that they are isolated faults that are associated with starting up production and this will be an effective weapon system and we will get it up to a very high level of reliability; but we haven't proven that at this point.

Senator WARNER. I am surprised there have been so few tests. Are they expensive to conduct?

General BURKE. It is fairly expensive. We had 20 tests in the competitive flyoff and we plan to have 19 in what we call the follow-on test and evaluation to iron out the bugs, if you will.

Senator WARNER. After the selection, you mean?

General BURKE. Yes, and then we plan perhaps six a year over time, just to keep evaluating the system and making sure it is not going bad sitting on the shelf.

Senator WARNER. Twenty was the target, and you have had only seven?

General BURKE. This is 7 of the 19; there are 12 more scheduled. If we don't improve this pretty soon, we will add to that.

Senator WARNER. Right now you have a stand-down subject to the reporting of your special investigating group?

General BURKE. Yes.

Senator WARNER. When do you expect that report to come in?

General BURKE. I think we will have it within a week or so.

Senator WARNER. Therefore, we assume there will be, hopefully, a resumption of the tests in 1 week or 10 days?

General BURKE. Yes.

Senator WARNER. And your target date will be the selection between the two systems?

General BURKE. The selection is completed.

Senator WARNER. I am sorry.

General BURKE. What we are trying to do is establish a high degree of confidence that we are building a reliable and effective missile.

Senator WARNER. I am sorry; I misunderstood.

There were 10 tests before selection and they have been completed; and what was the relative success or failure rate in that series?

General BURKE. The majority were successful. That test, again, would not have left one with a high degree of confidence in the reliability of either system, but I think it clearly demonstrated that we had a winner and a loser in the decision.

Senator WARNER. Now you are in the follow-on test with a selected system. I understand now.

General BURKE. It is a production version as opposed to the hand-built version we had before.

Senator WARNER. And the tests are not very satisfactory?

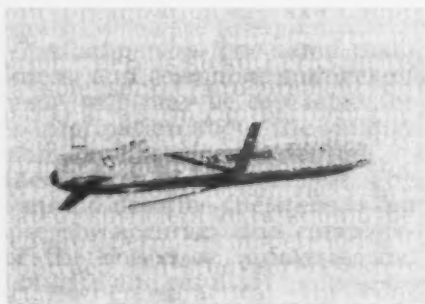
General BURKE. I would say that it is not satisfactory today but I don't think that we have undue concern at this point; but it clearly needs work.

Senator WARNER. I would hope that you would see me, personally, on this when this report comes back. We may have to schedule an additional hearing on this system, and any other members of the committee who want to look into it, feel free to do so.

General BURKE. We are also doing survivability testing in regard to the ALCM, and we have rigged a version of a small, inexpensive drone to have the same radar cross-section features of the air-launched cruise missile. We have been flying that against the most sophisticated air defenses that we have, and we have confirmed what we always believed, [deleted] the principle of the cruise missile, of course, is to have them in large numbers and to, in effect, win that battle by the principle of mass.

AIR LAUNCHED CRUISE MISSILE (ALCM)

PROGRAM SUMMARY



FY 82 RDT&E REQUEST

\$68.8M

- AIR VEHICLE - \$29.7
- ENGINE - \$ 5.1
- NAV/GUIDANCE - \$ 9.2
- OTHER - \$24.8

FY 82 WPN SYS PROC REQUEST

\$592.1M

- AIR FRAME - \$188.6
- ENGINE - \$ 97.2
- NAV/GUIDANCE - \$143.4
- OTHER - \$162.9

	FY 80 & PRIOR	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RD&E	909.5	106.6	58.8	CONT	CONT	1096.2
PROCUREMENT		544.3	592.1	CONT	CONT	4549.3

141

The research and development program will be essentially complete in 1982 and we will continue to buy the cruise missile, with nearly \$600 million in the 1981 budget. That buys 440 cruise missiles and we will propose to buy 440 a year until we complete that buy in 1989.

TANKER MODERNIZATION



Turning to the modernization of our KC-135 fleet, I show here one of our tankers, an artist's depiction, with a CFM-56 engine, and the point you made earlier, correctly, Mr. Chairman, that it is a very sound airplane and airframe but it does have an old, inefficient, and polluting engine, and that is a deficiency that ought to be corrected.

Our first problem with regard to air refueling is that we simply don't have enough of it. The need for air refueling has grown very steadily over the past 20 years, whereas our capability has actually shrunk during that same period of time. The single integrated operational plan, the general nuclear war plan of the United States, takes all 615 of those KC-135's, committed to related tasks and yet that plan is very much a tanker-limited plan.

[Deleted.] So we need more refueling to properly fly our bombers on that mission.

That problem gets worse as we add the ALCM, not only the weight, but a very substantial drag penalty on top of that. Meanwhile, we have developed a tactical fighter force, all of which is air-refueling capable, and we have plans that in the event of emergencies anywhere, those tactical fighters not only get to the trouble spot with KC-135 refueling, but also require the KC-135 to continue to refuel them as they operate, thereby increasing the capability and productivity of each of the individual fighters.

REFUELING FOR AIRLIFT

More and more, the requirement is for refueling for airlift. The C-5's are all air-refuelable, and the C-141's as they are being modified or being stretched, are also acquiring air-refueling capability; and C-X would certainly have air-refueling capability, too.

Our solution to that need is twofold: One is to reengine the KC-135's, and you can think of a reengineed KC-135 as worth about 1½ unreengineed KC-135's; and second, to procure some KC-10's.

Those two airplanes do rather different things and I would like to explain why I think we need to do both. First, with 642 KC-135's, clearly that is going to be the mainstay of the refueling force for the foreseeable future. It is really difficult for me to imagine that we would carry that old engine into the 21st century.

We like the large numbers of the KC-135 because we like to have the ability to put a lot of tankers in a lot of different places and do a lot of different jobs; but, most important, the least expensive way to add refueling capability is by reengining the KC-135's. But it does several important things. It frees us from dependence on the long runways and opens up perhaps 300 additional airfields in the United States and NATO that we could use; it solves that environmental problem that is increasingly severe, and it saves a great amount of fuel. Each KC-135 that we will reengine reduces consumption by approximately 130,000 gallons a year.

Senator WARNER. That is the 1½ factor?

General BURKE. You get that by the fact that the airplane can first carry more on takeoff.

Senator WARNER. Carries more fuel?

General BURKE. Yes, and it is going out to a refueling point and it burns a lot less, so when it gets there, it has about 1½ times as much.

Senator WARNER. You mean the KC-135 was developed in the beginning with an engine that could not fully support its internal capacity?

General BURKE. Yes, sir. It was the best we knew how to do in 1959.

Senator WARNER. And they overbuilt the fuselage with the expectation that a better engine would come along?

General BURKE. No; that is pretty much a standard 707 fuselage, and the fuel is dense, and you can just put a lot of fuel in there.

We also are proceeding with our purchase of KC-10's. It does some things that the KC-135 can't, and most importantly it provides the ability to project power at really long distances without reliance on en route bases and certainly we can't be sure of those. It also simultaneously carries the personnel and equipment that are necessary to support fighters.

In a typical mission, we would imagine the KC-10's flying into an attack fighter base and loading the support equipment and people, then leading the fighters to Israel or Egypt or wherever it is they are going. It does that in a way that the KC-135's just can't do.

KC-10A PERMITS NONSTOP FIGHTER DEPLOYMENTS

DEPLOYMENT TO SAUDI ARABIA



1979 DEPLOYMENT

- 12 F-15's
- 115 TONS OF EQUIPMENT
- 209 SUPPORT PERSONNEL

SUPPORT

- 16 KC-135A's
- 3 C-141's
- 2 C-5's
- FORWARD BASES USED
 - AZORES
 - SPAIN
- 2 DAY DEPLOYMENT

TANKER MODERNIZATION

WITH KC-10

- 8 KC-10's
- NO C-141's
- NO C-5's
- NO FORWARD BASES USED
- 1 DAY DEPLOYMENT
- FUEL SAVED, 800,000 GAL.

WITH KC-135 R

- 8 KC-135 R's
- 3 C-141's
- 2 C-5's
- ONE FORWARD BASE USED
- 1 DAY DEPLOYMENT
- FUEL SAVED, 406,000 GAL.

Here is an example, an actual mission that we flew in 1979. There were a dozen F-15's going to Saudi Arabia, and they require that much equipment and people to get the job done. We went through the mission and we used 16 KC-135's, but we required 3 C-141's to carry people and equipment. We also had to get the prior approval of both the Spanish and the Portuguese governments to do our refueling in Spain and land in the Azores, and it took 2 days.

If we did this next year, by which time we would have half a dozen KC-10's, we could do it with six KC-10's and none of the C-141's or KC-135's and no forward basing, and we could do it all in 1 day and save an enormous amount of fuel.

The KC-135 re-engine does better than the other engine, but it still requires the airlift and it requires a forward base to get that job done.

Senator WARNER. The KC-10's have the same engine that is in your kit for your KC-135?

General BURKE. No, sir, it is a larger engine, quite a bit larger.

Senator WARNER. But the same engineeringwise, it is the same principle in the engine?

General BURKE. It is a modern, fuel-efficient engine, essentially the same engine you would fly on a commercial DC-10 or 747. Both of those airplanes use GE and Pratt & Whitney, and this happens to be GE's; it is a 50,000-pound engine.

Senator WARNER. An off-the-shelf model?

General BURKE. Yes.

Senator WARNER. When you put in your authorization request, "13 kits," does that translate into 13 aircraft?

General BURKE. Yes, sir, that does.

Senator WARNER. So you are now beginning a slow re-engining process, with 13 aircraft to be re-engined in fiscal 1982?

General BURKE. Yes; building to six a month.

Senator WARNER. Building up to a production of six a month?

General BURKE. Yes.

Senator WARNER. That is optimum?

General BURKE. Yes.

KC-10 AIRCRAFT

Senator WARNER. How many KC-10's do you have?

General BURKE. There are eight KC-10's in the 1982 budget, which takes us to a total of 20; and, interestingly, we get delivery of the first next week, on St. Patrick's Day, and it goes to Barksdale Air Force Base, and we will be able to demonstrate that capability.

In regard to the KC-135 re-engining, we did select the CFM-56 which is the most modern and the most fuel efficient engine of this size in January of 1980. We have an agreement with the French Government. The French have 11 KC-135's just like ours, and they want to re-engine them, too, and they committed \$28 million as their share of the research and development and the startup costs on this and then they pay for their 11 airplanes as they go through.

We begin this modification this fall and have the first flight in 1982, as we said earlier.

Senator WARNER. To pause a moment, that is \$26.4 million. I am just curious why you need \$31 million to figure out how to put an engine on a plane, and it is an off-the-shelf engine?

General BURKE. That is a question that most people have when they look at it. It requires development of a new pylon to hang it on; a new nacelle to go around that engine, and it requires development and production of a new horizontal tail.

If we put this engine on and left the existing tail on the KC-135, it has so much power that if you made a go-around the nose would come up and you wouldn't have enough flight control authority to bring it down. I thought that the cost was high also—when I saw that I checked it with the commercial world and they put the same engine on the DC-8 and that is just about what they spent, too.

Senator WARNER. You would think you could translate that technology, after all of that learning curve out there, right to the military for a change, instead of the reverse?

General BURKE. We are with the engine, but it is making the engine compatible and doing all of the integration to get the controls and displays and all of that, and do it in a way that we will feel very comfortable about operating it for many years.

As we have already covered in regard to the KC-10, it is flying now and doing well; it is going to be certified by the FAA this month and delivered to us next week; and then in the 1982 budget, there is nearly \$1½ billion which procures eight airplanes.

Also a part of our program for modernization of the bomber leg is a program we call protective systems, that develops an electronic countermeasure system largely for the bomber force, but also has application for the tactical fighters.

We are looking at these types of technology in there.

Senator WARNER. Excuse me. To follow up on that last subject, the CBO is suggesting the KC-10 vis-a-vis the re-engining program. I would put something in the record on that.

General BURKE. I have seen the CBO report.

Senator WARNER. We should have something in this record on that point.

General BURKE. We will put our analysis of their analysis in the record.

[The information follows:]

ANALYSIS OF CBO REPORT

Air Force analyses show that a mix of reengined KC-135s and KC-10s is required to modernize the tanker force and meet the growing demands of the SIOP, general purpose, and airlift forces.

The final CBO report is not yet available for Air Force review. However, CBO preliminary papers (January and February 1981) indicate that only acquisition costs were considered and not the more meaningful total life cycle costs for the alternative systems. Life cycle costs indicate the real cost of ownership since these costs include both acquisition and the associated operational and support costs over the life of the aircraft.

Based on tanker effectiveness gained for dollars spent, the Air Force analyses show that the reengined KC-135 is the most cost effective alternative. The reengined KC-135 is a more fuel efficient aircraft than the KC-135A or the KC-10, and thus, will provide high fuel costs savings as the cost for jet fuel escalates. However, the KC-10 is required to provide long range support for the deployment of general purpose and airlift forces, thus releasing the KC-135s to fully support the SIOP. Therefore, simultaneous procurement of a mixed force of reengined KC-135s and the KC-10s is the solution for providing the needed aerial tanker capability.

General BURKE. I might say the fundamental difference is that they look only at acquisition costs, and we look at life cycle costs. They also used a lower number for the KC-10 than we are dealing with; and they also did not take note of the fact that for every one of the old engines we keep, for every airplane, we are going to have to spend \$1.5 million more to refurbish those old engines. We crank all of that in and you come in with a different conclusion; but we will put that in the record.

Senator WARNER. Thank you.

PROTECTIVE SYSTEMS

PROGRAM SUMMARY



FY 82 RDT&E REQUEST
\$ 108.7M

MONOPULSE RADAR ECM	\$42.7M
ALQ-117 IMPROVEMENT	\$43.5M
F/FB-111 PROTECTIVE SYST.	\$ 5.9M
INFRARED & EOCM	\$ 2.5M
COMPUTER SIM/ANAL/EVAL	\$ 5.7M
FLIGHT TEST SIMS/REPLICAS	\$ 6.9M
ANTENNA TEST RANGE	\$ 1.5M

	FY 80	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RDT&E	51.2	62.9	108.7	CONT	CONT	N/A

General BURKE. The Soviets have made substantial advances in their radars in recent years, all of which translate to increased threats to our system. In this protective system line here [indicating on chart] we are doing research and development, looking at things like how we cope with their multiple radar systems. We are getting some very encouraging results in that regard.

I might say that our basic approach with the B-52 is that we are no longer spending research and development money on the B-52 to keep it a penetrating bomber; it will retain its ECM set, and we will want to keep track of that and assess what needs to be done in regard to its vulnerability even after it becomes a cruise-missile carrier.

That is largely what this sort of work is concerned with.

We have a relatively small program called advanced cruise-missile technology, recognizing that the Soviets very likely will devote substantial resources to coping with the first generation cruise missile and suspecting that the bulk of that effort will probably go into efforts to attack the mother ship and get all of the eggs before they leave the basket.

ADVANCED CRUISE MISSILE TECHNOLOGY

DESCRIPTION



TECHNOLOGY ADVANCEMENT

PROPULSION
OBSERVABLES
AVIONICS

OPTION FOR FOLLOW-ON CM

PROPULSION HIGHEST PRIORITY

We have started some efforts to look at what we can do to counter that when it comes along. We are making technology assessments of how we can improve the existing cruise missile and in due course build a better cruise missile if we choose.

The most interesting thing to us is the propulsion, to get more fuel-efficient, small engines, so we can back up the launch position even further as they extend the defenses which appears as the easiest way to cope with that type of a Soviet threat.

Senator WARNER. All right, go ahead. I want to hear more about that one that you just flashed up there. These are two different designs of the advanced cruise missile?

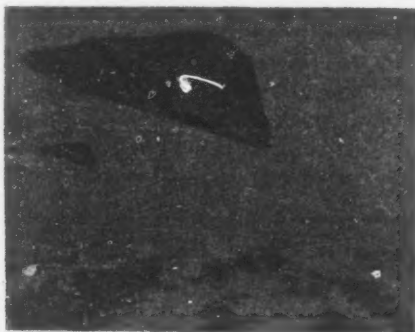
General BURKE. They are notional.

Senator WARNER. That is coupled onto an airplane for launch?

General BURKE. That is an artist's depiction and I am not at all sure that the next generation would look too much like that; but those are some that have been produced in a very preliminary way.

ADVANCED CRUISE MISSILE TECHNOLOGY

SUMMARY



FY 82 RDT&E REQUEST

30.1M

	FY 80 & PRIOR	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RDT&E	10.0	13.9	30.1	CONT	CONT	N/A

11

It is a little better than \$30 million for research and development for that program; that is, in 1982. It goes up by a little better than a factor of 2, and that is partly because we are going to assume some of the work that Portsmouth has been doing in that work, too.

A very intriguing program that we are looking at is an economy and fuel-saving effort. It is the notion of buying a companion trainer aircraft with which to do some of the training for our B-52 crews. B-52's are by far the most expensive airplanes we ever fly; they burn almost 4,000 gallons of fuel an hour, and the total cost for operation is about \$6,000 an hour, so we obviously have a strong motivation to reduce that flying time as much as we can.

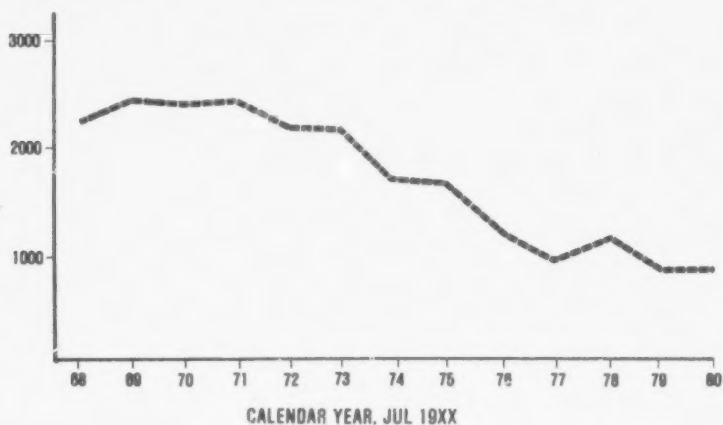
We are buying modern simulators for the B-52 and as they come onboard we will reduce flying hours and offset that in the simulators.

But there are a number of skills I think, which can only be taught and taught properly, particularly in an actual airplane. That is airmanship and inflight coordination, which you have to do in an airplane. We think that there is a real possibility that we could do some of that type of training in a much less expensive airplane than the B-52. That is the whole notion of the CTA, that we might be able to buy or lease small business-type jets which would fly at about one-fifteenth the cost of the B-52 and substitute in some manner that training in a smaller airplane for the training in the big airplane.

B-52 COMPANION TRAINER AIRCRAFT

— B-52 CREW FORCE AVERAGE FLIGHT EXPERIENCE —

AVG FLY HRS/CREW



33

One reason that needs to be done, that we do need to keep some minimum level of actual flying of B-52's, is that present crews are not the old group of seasoned veterans; they are quite young and and the average SAC crewmember is well under 30, and his average flying time, as you can see, has come down by a factor of 2 here in the last 15 years.

Senator WARNER. What is the number of hours per month the average SAC pilot is logging now?

General BURKE. Twenty-two hours.

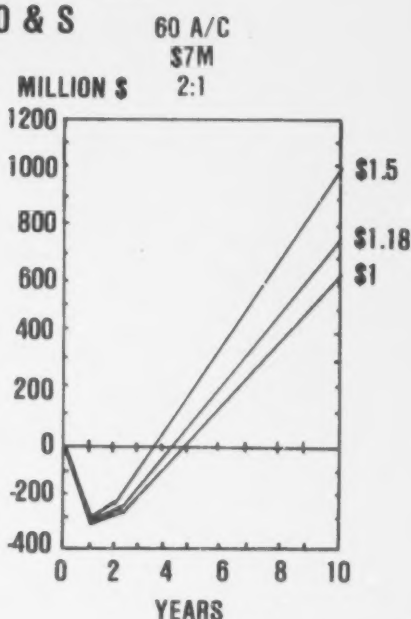
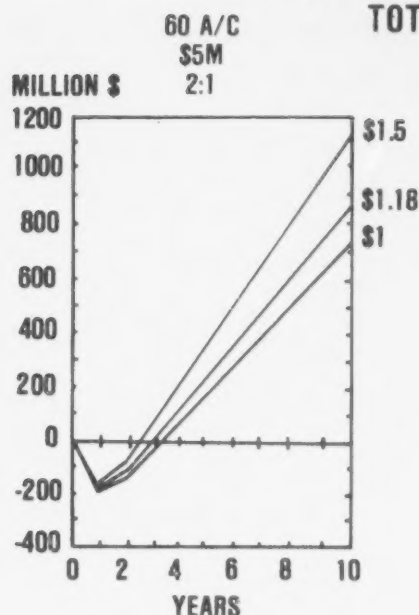
Senator WARNER. How does that compare with a decade ago?

General BURKE. It is a bit less than it was. It is from 1968; that is 12 years.

Senator WARNER. You said that was reduced by half, and you said 22 was nothing less in a decade?

General BURKE. This chart shows the number of hours that the average crewmember has accrued, and not what he is flying at a given time. That had to do with these people who were older and and often field-grade officers who spent a larger period of time in the cockpit; and these tend to be lieutenants and captains at the most.

PAYBACK ANALYSIS



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We don't know exactly what it will cost us to obtain these trainers and we need to confirm what the transfer of training would be; but we made a couple of reasonable assumptions. If we can buy them for about \$5 million, which doesn't seem unreasonable, and this chart is already out of date as most charts concerning cost of fuel are, we are actually paying \$1.18 now, and \$1.50 is not that hard to believe. If you could substitute 2 hours in the small airplane for 1 hour in the big airplane—and that is what you paid for it—the thing would pay for itself here in about 2½ years.

Senator WARNER. Let us open this up. You are talking about Gulfstream II?

General BURKE. Yes, that is a candidate.

Senator WARNER. You put a B-52 crew in the Gulfstream II?

General BURKE. Yes. We would modify the airplane.

Senator WARNER. And what else up front?

General BURKE. The general configuration is that the pilot and copilot sit up in front and you have something that looks like a B-52 and you have side by side in the middle of the cabin area the radar/navigator and the navigator, and they have replicas of the instrumentation they have in the B-52's.

In the rear you have the electronic warfare officer, the radar/navigator and navigator sit side by side in the airplane. It is intended to put a radar in it that would serve as a reasonable facsimile of the B-52 radar and you would be able to fly B-52-type missions; and you would be able to go in the bomb-training runs at low altitude and at high speed and simulate releasing bombs and go through all of the crew coordination procedures.

Senator WARNER. And the principal saving would be fuel?

General BURKE. Yes.

Senator WARNER. And these planes would presumably be operating around the clock?

General BURKE. We would fly them pretty heavily; yes.

Senator WARNER. And it would give the gentlemen and ladies the proper number of flight hours, and they would come away from that cockpit with just about the same training benefits that they would with a comparable period of time in the big aircraft?

General BURKE. We just guessed that 2 hours in the little one would equal 1 hour in the big one, and that is what these calculations show.

Our initial program is to prove or disprove that; but we had some experience in that line that is very encouraging. Several years ago we took some surplus trainers, mostly the T-37's and put them in T-38's and some of our B-52 and KC-135 copilots, to hone their airmanship skills. They tend to spend the first several years in the right seat of those airplanes and they are not attuned to making critical decisions in flight and functioning as they later will have to do. You can hardly find two more dissimilar airplanes, and yet we found very good training that accrued from that.

What we need to do is prove our case, and what we propose to do this fiscal year is take two of the T-39 aircraft and modify them and do a flight evaluation and confirm that the training will transfer. If all of that works out, then we are ready to go out to industry and either buy or perhaps lease airplanes for that purpose.

In 1982 we would do that and go ahead and configure them as we expected to have to do that.

We have a new term and a new program, counter SUAWACS. It has its history in ASALM, the Advanced Strategic Air-Launched Missile. For several years we were pursuing fairly vigorously a technology of a long-range, high-speed missile, several hundred miles in range, that would have two capabilities—it would be a ground attack version and it would perhaps supplement the SRAM missile, but it was more important to have a capability of getting the Soviet AWACS, to shoot down the Soviet AWACS.

That program had technical problems and it began to look a bit more expensive than the current threat would justify, so we scaled that down last year and we basically have slowed the program down and are focusing on that technology and other complementary technologies that will let us deal with the Soviet AWACS in time.

We are looking not only at an air-to-air missile but also at ECM and decoys and communications jamming; but it is a considerably more modest program that we talked about last year, or the year before, for the ASALM. That is \$10.4 million, most of which is associated with what is still the most vexing problem, and that is, how to develop the air-to-air guidance so that you could successfully attack a Soviet AWACS once he shuts down his radar. It is easy as long as he is radiating, but once he shuts down, that is a tough problem.

That is what we are doing with that program.

LONG RANGE COMBAT AIRCRAFT

— STATUS/PROGRAM SUMMARY —



CONTINUING BOMBER PENETRATION
EVALUATION (B-1) PROGRAM
EVALUATING CONTRACTOR PROPOSALS
COMPLETING QUANTITATIVE
ANALYSES



	FY 80 & PRIOR	FY 81	FY 82	FY 83	TO COMPLETE	TOTAL
RD&E	15.0*	260.4	302.0	TBD	CONT	N/A
PROC	-	-	2121.0	TBD	CONT	N/A

* UNDER CMCA PROGRAM

111

Finally, in regard to the new bomber, the long-range combat aircraft, the Air Force is at present doing two things to help illuminate the issues that will let us all make decisions on that question: We are continuing the last phases of a program that we call bomber penetration evaluation, which involves the use of the B-1 aircraft. You will recall we built four B-1's and we continued that test program, but most of it in the past year has focused on the use of the fourth and final B-1, which is the only airplane that is fully mission equipped and it has both the offensive avionics and defensive avionics and the countermeasures.

We have been flying that airplane in an operational-type environment at Edwards Air Force Base and elsewhere, testing the efficacy of that very modern, sophisticated electronic system that is in that airplane; and I must say that those test results are generally encouraging. It is an excellent system and it is doing quite well, even against very modern defensive systems. But out of that we are gathering very useful empirical data as to what electronic countermeasures will do and what they won't do, and all of that is being followed up for future evaluation.

We have also just recently begun the evaluation of the contractors' proposals for a new bomber. The Aeronautical Systems Division at Wright-Patterson AFB went to all of the potential manufacturers of this new airplane and asked them to submit contractually binding proposals, how they were going to build it, and that has just recently been received, and we now are in negotiation with each of those manufacturers, finding out what is in the proposal or what the numbers are.

AIR FORCE LONG-RANGE COMBAT AIRCRAFT

To conclude that, Mr. Chairman, the other thing the Air Force is doing with regard to selecting long-range combat aircraft is a whole host of quantitative analyses of all of the factors that make such an airplane useful, and how low RCS and speed and penetration will interact, and all of that, I think, will shed a great deal of light on the question and help us make a decision.

Pending that, the President's 1982 budget includes nearly \$2.5 billion, a little over \$300 million of which is in research and development, and a little better than \$2 billion in procurement. All of this then will serve as input to the study that is being conducted by the Office of the Secretary of Defense under the chairmanship of Dr. Zeiberg, and that will be the basic material to be provided to the Secretary of Defense for his decision.

And I would now like to conclude my presentation and let Dr. Zeiberg review his work with you, or you might wish to have questions at this point.

Senator WARNER. We will go ahead with Dr. Zeiberg.

Would you put in the record, Dr. Zeiberg, a document which I understand the Secretary of Defense prepared with respect to what is in the clear relative to the Stealth program?

General BURKE. It is in the clear; it is secret, I think.

Senator WARNER. The record should contain that—I think it was Secretary Brown who prepared that document—because when we get to the floor I have to know the bounds within which I and other members of this committee can discuss that issue.

I would admonish the committee to, of course, remain within the framework.

[The information follows:

STEALTH PROGRAM

The document to which you referred was a memorandum prepared by Dr. Perry. A copy of this memorandum is attached.

OFFICE OF THE UNDER SECRETARY OF DEFENSE,
Washington, D.C., October 8, 1980.

Subject: Stealth program.

Recent events concerning the stealth program have required a thorough review of security procedures. Set forth below are policy guidelines for those persons who are knowledgeable of stealth program information.

The following facts concerning the stealth program are considered unclassified:

The existence of a development program to reduce the detectability of military vehicles by air defense systems;

The applicable technology utilizes a combination of technical approaches to negate the effectiveness of radar dependent and other air defenses;

The technology can be applied to manned and unmanned vehicles;

The technology has been under development for several decades and has been aggressively pursued for at least three years;

There have been flight tests of different vehicles incorporating the technology.

Budget information regarding the bomber and Teal Dawn programs.

Your assistance is vital in limiting disclosures of the stealth program to this brief set of facts. As you know, the stealth program has been under extraordinary security protection. In order to continue to protect the extremely critical and sensitive aspects, stringent protection—to include specific determination of need to know—will be maintained concerning the following:

Specific techniques employed to reduce detectability;
 Degree of success of each of these techniques;
 Characteristics of specific vehicles being developed;
 Mission related data, to include testing plans and operations;
 Budgeting and programming information including funds being applied to specific programs;
 Schedules of specific programs; and
 Identity of contractors and government agencies involved.

STATEMENT OF DR. SEYMOUR L. ZEIBERG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (STRATEGIC AND SPACE SYSTEMS) DEPARTMENT OF DEFENSE

Dr. ZEIBERG. I will review the status of the bomber study and provide you with a summary of the interim report which will be issued sometime in the next few weeks. This chart outlines our schedule.

REPORT SCHEDULE

March 15, 1981: Interim/status report.
 March-June: Complete study; proposal evaluation/contract negotiations.
 May 1: Report completed.
 May 1-June 1: Secretarial/administration decision.
 June 1: Final report to Congress and contract award.

Let me describe why the report is later than the 15th of March date that was called for.

Senator WARNER. Let me interrupt. Congress set that 15 March date last year, and in testimony now we have been informed that it has been delayed. I will put the question to counsel for the committee: Has the formalization been completed between the Department of Defense and the chairman of the committee, and has the committee acquiesced in this, or have we been informally advised, and what is the status of that?

Mr. RON LEHMAN. The chairman spoke to the Defense Secretary, Secretary Weinberger, and it is agreed there will be an interim report on March 15, and the final report would be expedited.

Senator WARNER. The chairman has waived the March 15, 1981, date?

Mr. RON LEHMAN. For formal recommendations; yes.

Senator WARNER. That has been done?

Mr. RON LEHMAN. Yes.

Senator WARNER. So often we go to a great deal of work in these committees to establish a time and then the Pentagon doesn't meet the time. Having been on the other end, I know what the desire is, but on this end I want to get it clear in mind. What has been formalized?

Mr. RON LEHMAN. That the report be expedited.

Senator WARNER. I understand the desire, but the date has been waived?

Mr. RON LEHMAN. Yes; that is correct.

Dr. ZEIBERG. The key element causing the delay is the fact that we would like to enter the decision with firm negotiated contracts on the aircraft, rather than a decision made on the basis of in-house analysis which would be vulnerable to changes once industry got their hands on it.

The plan was formulated to have the Air Force solicit proposals from industry and actually go through the negotiations, so that on the day of decision a program could start with final costs and a confident schedule. The judgment we made was that it was best to do that early in a competitive environment rather than to do it later, once the decision was made. It saves time and money by spending a little more time early in the program.

What has developed then is a schedule as indicated here. By June 1 we hope to have an administration decision and a report to Congress. During May we will have deliberations leading to that decision. By May 1 we expect to have all of the technical work done to lay out the options as a basis for the decision.

Senator WARNER. Who are the participants in this?

Dr. ZEIBERG. The participants are Air Force and OSD. My office is chairing the activity. It involves the research and development side that I represent, and the analysis side of the house represented by P.A. & E. There is some input from the policy people, although they don't play a very important role here. All of the important operating groups within the Air Force that have responsibility in bomber matters are also involved. That includes the Air Staff the Air Force Systems Command, and SAC. SAC and TAC have gotten into it, as well as various supporting groups in areas such as logistics support. Air Force studies and analyses is doing all of the analytical work to support the decision.

Senator WARNER. I think there are some outside contractors invited, or is that in the MX system?

Dr. ZEIBERG. I have some consultants helping me, and they are part of the study team. These people are very distinguished in certain areas, such as electronic countermeasures. They work on the study team for us, but they are not a separate review panel.

The MX is being reviewed by a panel of outsiders. It hasn't started yet, but it will start in a few weeks.

Senator WARNER. The Department of the Air Force will speak with one voice, I presume, and the Chief of Staff evaluate the competitive opinions within your department?

General ALLEN. Yes, sir.

Senator WARNER. And the P.A. & E. will have an input and the R. & D. section will have an input, so the Secretary of Defense has sort of a triumvirate bearing down on this; would that be correct?

Dr. ZEIBERG. Yes.

Senator WARNER. And he will be the focal point and presumably he will speak with one voice for the entire Department of Defense in the ultimate contract?

Dr. ZEIBERG. Yes. I can walk through the study and some of the results. I have to be cautious to avoid mention of the Stealth program. There are certain considerations that stop me from that.

Senator WARNER. Are you familiar with the document?

Dr. ZEIBERG. I am familiar with the one that Secretary Brown issued last fall. I will mention whatever I can.

Senator WARNER. Let us be on the very conservative side with respect to this record, but I do believe it is helpful to interject that material which is in the clear now.

Dr. ZEIBERG. I will mention where some unique generic features of the advanced technology bear on the decision, but I will avoid specific discussion of characteristics of those airplanes and the underlying technology.

ROLES AND MISSIONS

Strategic nuclear war: immediate phase; protracted war/reserved force.

World wide force projection.

NATO support.

Theater nuclear.

Maritime.

We are reviewing the total question starting from a formulation of the roles and missions for the bombers, with some changes in our policy regarding strategic warfare. As evidenced in Presidential Directive 59 last year, there is concern with our war-fighting capabilities and the ability to conduct protracted war by retaining a portion of our forces in reserve. There is also a growing recognition of the need for force projection in various parts of the world using strategic bombers to deliver conventional weapons. This appears to be an important, role, comparable to that of the strategic nuclear role.

We feel it is desirable to walk through all of the potential roles and missions and generate an understanding of how the unique use of bombers in these categories might bear on the design and then look for an envelope of design considerations that all of the contractors could work with.

There will be a body of detail in this general area issued as companion documents to the final summary report.

MULTIROLE BOMBER

I want to give you just one illustration this morning about how these things get into the act. This is one of particular interest these days. This shows how the multirole bomber, the MRB, can be used to alleviate some airlift operations in two scenarios that are being used in our CX studies [chart deleted].

This is rather a large-scale NATO effort here and the other is a Middle East contingency involving [deleted] I won't go through the details of the scenario, but I will point out the role that a bomber can play in some of these circumstances.

The vertical axis shows airlift cargo in thousands of tons and the horizontal axis is the time in days after the start of the contingency. There are two lines for each of the scenarios. The top line shows the airlift demand without the use of bombers in a supporting role, and the bottom line shows what happens when we temporarily replace tactical air forces with bombers; that is an equal trade with bombs being dropped from a bomber replacing those dropped from a tactical airplane. The way to read this is that we reduce the closure time because the airlift necessary to bring in the tactical air force is then reduced.

Earlier, General Burke pointed out some numbers on one mission we executed last year, and I will recall those numbers for you. It takes about 10 tons of equipment and about 20 people to support an F-15. The airlift you would dedicate for that support equipment and those people could be applied to the ground fighting forces if you use the bombers instead of attempting to bring in tactical air in the

first few days. That is a significant reduction in the early phases and also puts us in a position to interdict before any incursion can penetrate deeply into the area.

So, the role of the bomber, particularly of an alert bomber which can get any place in the world in about 12 to 18 hours, can be very significant and have a very profound effect on how we could project force.

FB-111 AND THE B-1 CHARACTERISTICS

Let me next sketch out characteristics of the FB-111 and the B-1 and then go on to describe some particular features of them.

First, the FB-111 is an existing airplane. Under an unconstrained budget situation, we could have an IOC for the stretched version in the last quarter of 1984. With the currently perceived fiscal levels; namely, no additional fiscal year 1981 money, an IOC is likely toward the end of 1985. The 1981 money could be applied to long-lead material.

The B-1 we are dealing with is a modernization of the 1977 B-1. I will describe the details later. Again, with an unconstrained funding situation we could have that airplane in the fourth quarter of 1985. With currently perceived limitations, it is likely to be a year later, just about the end of 1986. Again, it is a question of long-lead funding that could be applied this year. Today's version versus the 1977 version is close to 100,000 pounds heavier, largely loading it up to levels we now think to be safer on the basis of further flight testing and investigation. The attempt was made to get more range out of the airplane. The loading shows up as additional weapon carriage as well as fuel. We also perceived that we would be able to install relevant hard point mountings and ejection equipment to carry [deleted] ALCM's. By raising the takeoff gross weight we increase the takeoff distance, but that still would be within tolerable bounds and doesn't stress us in any basic context.

The speed drops to just slightly supersonic but the airplane would be very efficient to fly at those speeds. You ought to think of this basically as a subsonic airplane.

One of the principal reasons for this change was to reduce the radar cross section. I will show you some particular data on that based on the development testing we have done. We were able to reduce the radar cross-section of the airplane by about a factor of [deleted] this is also true for the FB-111. We got them down to relatively low levels by an application of some of the stealth technology.

Senator WARNER. You mean reduce the cross-section, say, from a base of [deleted].

Dr. ZEIBERG. No; basically from about [deleted] it is about [deleted] for the original version.

Senator WARNER. Let us do it in percentages.

Dr. ZEIBERG. [deleted] we reduced it by a factor of [deleted].

Senator WARNER. It is [deleted] of what it was?

Dr. ZEIBERG. Yes.

Senator WARNER. That is clear.

Dr. ZEIBERG. The same thing is true for the FB-111. That makes other ECM techniques very practical. I will describe that later.

The range of the FB-111 is quite constrained and very heavily dependent upon the use of tankers. All of the airplanes fly as low as [deleted] feet with automatic terrain following, ATF.

I would like to walk through a little more on each of these aircraft.

Senator NUNN. Is that range down there with or without refueling?

Dr. ZEIBERG. That is an unrefueled range for a particular flight profile where the airplane flies [deleted] miles at low altitude over the target area and the rest of the flight is at high altitude.

Senator NUNN. And all of those ranges are at maximum payload?

Dr. ZEIBERG. Yes; it is maximum weapon carriage for the range indicated. Under these conditions the B-1 MRB could carry about [deleted] SRAMS and the FB-111B/C about [deleted] the 1977 version of the B-1 would need refueling.

Senator NUNN. What is the difference between the B-1 when you drop an ATF at the bottom of that?

Dr. ZEIBERG. [Deleted] That is [deleted] feet above the ground using automatic terrain following. That is a relatively standard capability we can build into any airplane these days.

Senator NUNN. You are saying on both the FB-111 and the B-1 you can reduce the cross-section by a factor of [deleted].

Dr. ZEIBERG. Yes; we can apply the radar absorbing materials selectively on these airplanes, and we can redesign the inlets so that we eliminate a very large radar reflecting feature. It tends to be perhaps the single largest reflector on most airplanes.

Senator NUNN. How about the MRB?

Dr. ZEIBERG. On this airplane, you mean, or the advanced technology aircraft?

Senator NUNN. You are reducing the cross section of the B-1 and you are talking about both of those airplanes?

Dr. ZEILBERG. Yes. This B-1 is the 1981 version of the one that existed at the time.

In fact your radar cross section reduction is one of the major steps in going from the original B-1 to today's B-1.

Let me show you some specifics on those two classes of airplanes. The evolution of the FB-111 B/C is indicated, with a trace from its original configuration, the FB-111A, which is currently committed to SAC operations, as part of the SIOP, and the FB-111D, which is committed to the tactical air forces. The "A" becomes the "B" and the "D" becomes the "C" by various detailed changes, all outlined here.

The airframe is stretched about 15 feet and the gross weight is increased about 30,000 pounds. As a result new main landing gear is necessary.

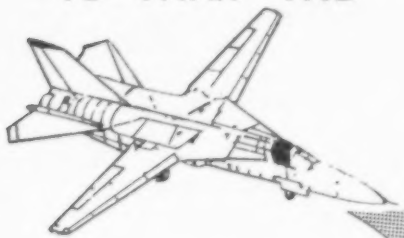
The propulsion is upgraded by installation of the F-101 engine, and an auxiliary power unit is necessary to start the engine autonomously. There are new inlets which are necessary to accommodate those new engines, as well as to allow for RCS improvements.

The new electronics that are put on would be EMP hardened, as with all line replaceable units, or black boxes, that we install.

In the avionics area, the defensive avionics would have to be upgraded considerably for SIOP missions. That could not be done on the schedule I cited earlier. The first 35 airplanes would be missed. This is, in effect, a long pole in any upgrading.

FB-111 TRACE

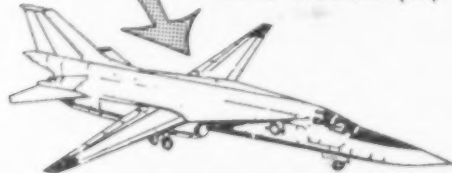
FB-111A/F-111D



- NEW AIRFRAME (15 FT)
 - FORWARD FUSELAGE
 - AFT FUSELAGE
- NEW MAIN LANDING GEAR PROPULSION
 - F-101 ENGINES
 - APU
- NEW INLETS
- RCS IMPROVEMENTS
- EMP HARD (NEW LRU)

• AVIONICS

- NEW DEFENSIVE SYSTEM
 - RETROFIT
 - MONOPULSE
- STRATEGIC INS & BACKUP
- TERRAIN FOLLOW RADAR
- DOPPLER
- MODS TO
 - ATTACK RADAR (F-111D)
 - COMPUTER
- NO ALCM CAPABILITY
- CONV WEAPONS (52)



FB-111B/C BASELINE

The rest of the airplanes could be done on schedule. So our plan for the avionics will show that going on in parallel; modifying airplanes and later retrofitting the first 35, rather than slow the whole program down.

Monopulse is a particular ECM issue. [Deleted.]

Those techniques would be incorporated in the FB-111 along with other avionics changes. We would use a new inertial navigation system and a backup. We usually have two in a long-range airplane. The navigation system that currently exists is not adequate for the mission. We also need upgrading in the terrain-following radar, the Doppler part of the navigation system, and the offensive avionics in terms of the attack radar. The existing system in the F-111D is suitable for the strategic mission and the accompanying computer does not have adequate capacity for delivery and management of the weapons we would install.

You can't carry ALCM's on this airplane. There are two reasons. First, ALCM is very big relative to other weapons carried by the FB-111A, and has a pylon which attaches the missile to the aircraft. This combination of missile and pylon creates a lot of drag on an airplane that already has very short legs. Therefore you get a very inefficient airplane.

Second, there is some question about whether there is enough clearance from the ground as you pull up on takeoff. This is a safety issue. On the airplane in its stretched mode you can carry up to [deleted] bombs.

F-111 MODIFICATION

This chart [deleted] shows what is new and what is old for the modification. The clear areas are new and the colored areas retained from the original airplane. The orange shows retention from the F-111D, the tactical version of the existing airplane. The blue wing extension would be necessary on the D's to make them look like A's, which are the strategic version of the F-111.

All of the colored areas will be what carries over from today into this stretched airplane.

Senator WARNER. In the history of the Air Force, General Allen, have we ever undertaken a modification program of this magnitude to an existing inventory?

General ALLEN. I can't recall one.

General BURKE. No; I think it would be fair to say this would be the most extensive modification we have ever done.

Senator NUNN. How would that compare with the C-141 stretch?

General BURKE. The C-141 stretch is a very simple modification.

Senator NUNN. Would it be 10 times more complicated, or 40 percent more, or how do you compare it?

Dr. ZEIBERG. Perhaps I can give you an idea. The equivalent stretch on the C-141 would be like adding the section. It would be no worse than this on a relative scale. Everything else would be the same. It is literally a plug in the fuselage aft of the wings and it is a dumb plug. The plug for the FB-111 has a lot of avionics and complex aerodynamics. In the C-141 it is simply a straight hull section for the storage of cargo.

Senator WARNER. Do we know of any other nation that has undertaken a modification of this extent to an aircraft inventory?

General ALLEN. I can't recall one.

Senator NUNN. Really, this is a landmark concept.

General ALLEN. I hadn't thought of it, really, very much that way. It is a very major modification, yes, sir.

Senator NUNN. How does it compare going from a high to a low altitude on the B-52?

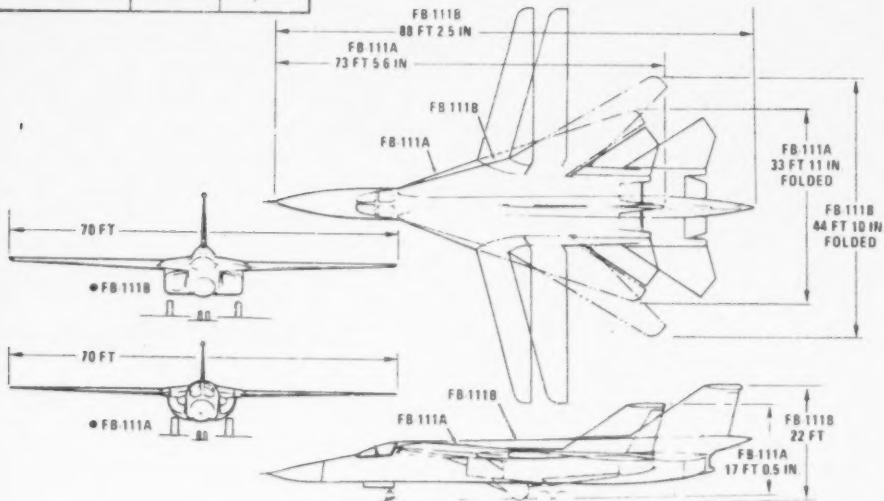
General ALLEN. The B-52 had a very fortuitous characteristic, in that we were able to do that without a great deal of modification. We did have to, over the years, add a good deal of structure into the airplane. I think that even over all of the years that we have done that, it doesn't come close to this kind of a modification.

General BURKE. Major changes to the B-52 and most other modifications made in airplanes had to do with updating electronics; that is, electronic technology tends to grow faster these days than the engine or airframe technology does, but I would say the B-52 modification in total would be something less than that.

Dr. ZEIBERG. The B-52 adaptation to low altitude flight was largely concerned with fatigue life issues. You could fly it low using terrain-following and later fly it higher if structural problems arose. In the FB-111A and F-111D cases, these aircraft have inadequate range and payload capabilities. So they would have to be extensively modified as illustrated to increase their capabilities.

FB-111B/FB-111A CHARACTERISTICS COMPARISON

	FB-111A	FB-111B
POWER PLANT	TF30-P-7	F101-GE-102
MAX TAKEOFF WT	114,300 Lbs	140,000 Lbs
MAX INFLIGHT WT	122,900 Lbs	155,000 Lbs



B21729A

When you overlay the old and the new, they would look this way. I point out the large change in the takeoff weight, about 20,000 pounds, and the stretch of the fuselage line here. We did some testing with a quarter scale model of the FB-111 to reduce the radar cross-section. That involves some application of the radar-absorbing material in selected spots. It was dominated, for instance, by the inlets. The radar waves attracting the inlet and they bounce back over the face of the engine. That acts almost like a lens. So you get an apparently greater amount coming back than went in, but that is only because it is focused.

If you can take measures to wipe out a reflection from the face of the engine by putting materials in there and changing the reflecting surface orientations, you generally get a very large reduction in radar cross-section. That is indeed what showed up. It went down by roughly a factor of [deleted].

[Chart deleted.]

The solid curve shows the radar cross-section of the existing airplane based on some testing done in 1975. This shows what happens with the proposed airplane based on scale model testing. The radar cross-section is down by roughly a factor of [deleted].

Senator WARNER. Perhaps on that chart you could show us the B-1 variance?

Dr. ZEIBERG. I will show you a chart of the B-1 in a moment. It would start there and we have driven it down to there.

Senator WARNER. Is that comparable?

Dr. ZEIBERG. This is a smaller airplane so it would have a smaller cross-section. When I get to the B-1 I will discuss what that means in terms of ECM. That is the principal payoff.

[Chart deleted.]

This shows the B-1 as it is now flying. While I have it up, the changes to the inside of those inlets, both on the B-1 and the FB-111, produce most of that radar cross-section reduction.

The evolution of the B-1 from its 1977 version to the one we will propose as a candidate is indicated here. We will enhance the offensive avionics system principally by bringing it up to date. In 1977 it would have used some equipment in production then but which is no longer available. We will make the offensive equipment here compatible with what is now available from industry, and in some cases in production for the B-52.

With greater emphasis on a broader military role, particularly the conventional use in force projection missions, we feel the need for a higher quality radar than was included in the original version, this would be a radar that could, for example, find ground forces in motion and look for vehicles of large truck size moving on the order of 5 to 10 miles per hour. We may want—this is not decided yet—to have a forward-looking infrared system to aid those missions.

The defensive system requires a large upgrade, principally because of the evolution of more significant Soviet threats than existed at the time of the original B-1 design. In particular, the items shown indicate the emphasis at the [deleted]. We need to anticipate those appearing by the end of the 1980's, and we need considerable upgrading of the defensive avionics. That is a pretty expensive venture.

I will show you the RCS improvements in a moment. The airplane was designed to be EMP hard and there is nothing new except that the new equipment would have to follow some particularly rigid specifications. The increased weight requires some strengthening of the landing gear. This turns out to be relatively straightforward, because the main structural elements in the landing gear are hollowed out. We strengthen them by not boring out as much as we originally did. We will limit the wing sweep to 60 degrees a sweep of 67.5° was required [deleted] We don't need that with the current configuration, and, in fact, because of the RCS improvements, we really can't go much [deleted]. The unit redesign won't permit efficient flight [deleted].

Senator WARNER. It is [deleted].

Dr. ZEIBERG. Yes, but that [deleted].

Senator WARNER. In fairness to President Carter, he made a decision called the B-1 decision, and this one is a substantial variant.

Can you talk to me personally about that? I want to get the politics out of this thing, and I think that it is senseless to keep pounding old decisions back there. This is a quantum change, and it seems to me that that change justifies a renaming, to the B-2.

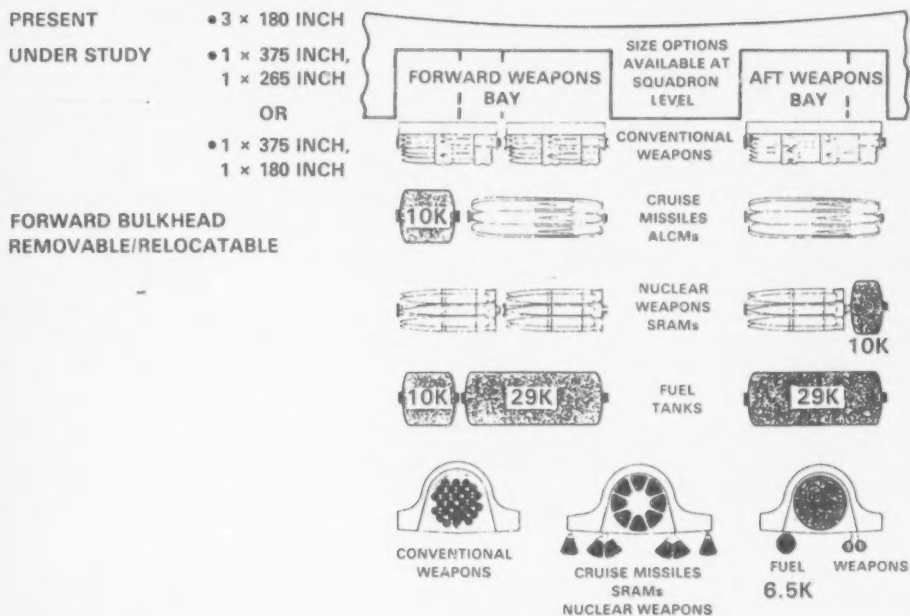
General ALLEN. I understand your point, and let us consider that, and we will respond to that.

Dr. ZEIBERG. This wing sweep saves money, and it makes the wing fairing, a part of the structure behind the wing/body juncture, a lot simpler and therefore cheaper to manufacture.

The auxiliary power unit would allow us to start the airplane autonomously and one engine can be used to start all of the others. That is an important consideration when operating in a dispersed mode. It might be necessary in these crisis times or during a nuclear war when some of the airplanes would be held back for the reserve force.

The forward weapon bay will be enlarged and I will show you some sketches of that in a moment. This change will allow greater weapon carriage as indicated here. That is up to about two dozen ALCMs or 142 conventional weapons.

WEAPONS BAYS (2 VERSUS 3)



This sketch shows the weapon bays. The original airplane had a large forward bay that was partitioned about in the middle, and an aft bay. Each could accommodate weapons up to 180 inches in length. What we envision is making that partition in the forward bay movable so that we can open it up entirely or adjust it with simple field-level modifications. We haven't decided yet, but my guess is that we probably will enlarge the aft bay. That takes a little more engineering work. There is some structure that has to be relocated and some equipment that has to be moved. This opening of the forward bay is a trivial step. With those larger bays, we then have greater flexibility for weapon loading. These sketches indicate how the weapons could be put in, along with extra fuel tanks, as indicated here. We could carry 22 or 30 ALCM's depending upon the final size of the "aft" bay. Fourteen would be carried externally plus 8 or 16 internally. Or, we could load fuel tanks into the "aft" bay and at certain external locations instead of ALCM's. Another combination would permit ALCM's externally with SRAM's internally.

Twenty-four SRAM's is the internal capacity, but again this can be offloaded to permit additional fuel. The aircraft can also accommodate up to 142 conventional weapons.

[Chart deleted.]

The reduction of radar cross section is indicated here. We started out with a radar cross section slightly above [deleted] square meters [deleted] and with our quarter-scale model RATSCAT testing, we are down in the vicinity of [deleted] square meter.

All of this is roughly a factor of [deleted] translated up relative to the FB-111. That is due to the relative size of the airplane. With radar cross sections in the vicinity of [deleted] some new ECM techniques become feasible. I will show one here.

[Chart deleted.]

[Deleted.]

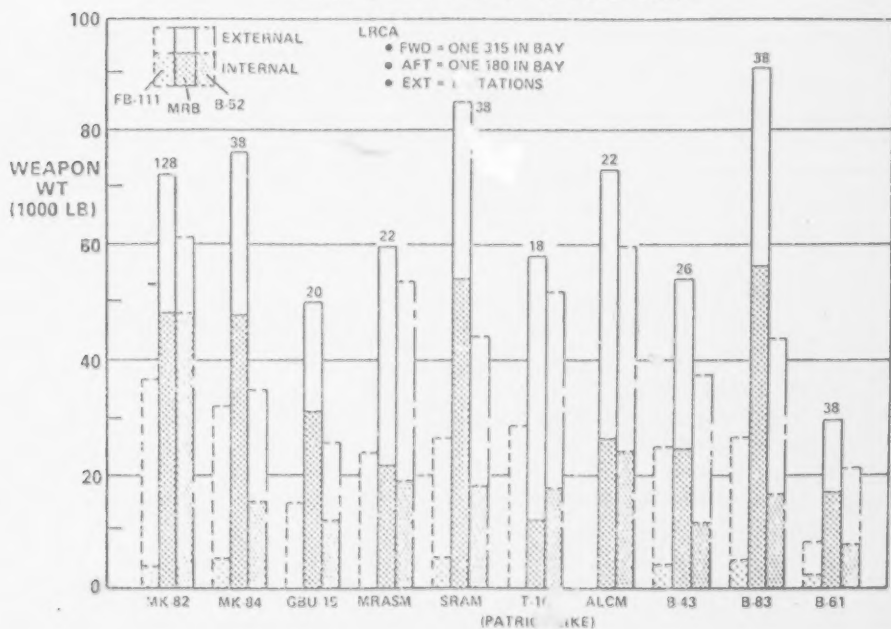
We are also evaluating application of this technique for use in cruise missiles at some point in time, if it becomes necessary to do that. The low cross-section of the airplane allows you to do this with a minimum amount of power. Once you are in the [deleted] or less vicinity this can be done with [deleted] of power. If you are in the B-52 category, you need [deleted] of power [deleted].

You have to get to that threshold of [deleted] and that really is an indication that our thinking is leaning in the direction of combinations of Stealth and ECM rather than depending solely on one or the other.

This is becoming the general line of thinking which carries through to the advanced technology aircraft concepts as well.

WEAPON CARRIAGE CAPABILITIES

B-1 MRB, FB-111B/C, B-52D, G OR H



This chart compares the weapon-carrying capability of the three airplanes for a variety of weapons. This is the overall limit. They don't fly very far with that type of payload. The shaded area indicates the internal carriage limitation. That is based on structural and volume considerations. There are three bars here. On the left is the FB-111 B/C, in the middle is the B-1 upgrade, the MRB, and on the right is the B-52. You will observe that the payload and large internal volume in the B-1 makes it a leader in all of these weapon categories. It is far and away the leader on the basis of weapons carried per unit of airplane size, or whatever other measure you might want to use.

That is part of the story. Range/payload considerations have to be used with the previous chart to draw some conclusions about what airplane is the best one to improve. This shows payload versus range for what is called the SIOP mission, where we fly [deleted]. While the FB-111 can carry about [deleted] weapons, it doesn't go very far with those weapons. To achieve ranges of about [deleted] miles [deleted] the FB-111B/C must be refueled once.

The other extreme, the B-1 MRB, has a greater range because we have made it heavier. [Deleted] which provides greater operational flexibility for the aircraft. In fact, it has considerably greater range with the same payload than does the B-52H.

What we are doing right now, Senator Warner, is to put a lot of technical data together and focus on the decision issues. We have developed information in the following categories: (1) the need, the question of whether it can be afforded and the companion question of the cost/effectiveness, and the question of the legacy that the airplane offers to the future, and its resilience to any threats that might evolve in the future.

On the technical side of the actual choice among the airplanes, we have studied the details of range, payload, speed and altitude; as well as radar cross-section and confidence in ECM, versus confidence in stealth, or perhaps a combination.

Very important in the issue of the stealth concept is the maturity of the technology, as to whether, given the perceived military and perceptual needs, do we have enough confidence to do that now, or is that something that we should wait for, because, as you know, that is a fairly complicated debate. [Deleted]. Hopefully we will proceed cautiously so as not to overcommit on something which has a potentially great importance to the forces.

All of that will come out in the final report. The interim report we are about to issue will not consider those questions in any detail other than to state them, for two reasons. We haven't yet reached conclusions. Of comparable importance, we are still competing one airplane versus another, and we don't want to publish anything which is competition sensitive and provides a little leverage for any one contractor versus another.

We are prepared to discuss this in private with you and other key members and to do it at the all-source level as appropriate.

I will convey that commitment to the Secretary so that when he is comfortable about his feelings he will meet with you.

Next is the question of affordability.

Senator WARNER. I take this assignment of being chairman with all of the accoutrements of office, and I feel I should know as much in advance as possible so I can begin to think about how and in what timeframe I can most expeditiously share that knowledge with the subcommittee, and then eventually with the full committee. It is a question of how we bring our colleagues along on that key situation. Time is of the essence at this point.

AFFORDABLE AIRPLANE PROGRAMS

Dr. ZEIBERG. Let me comment on the question of affordability. Which creeps in on two accounts: One is the question of whether we can afford any new major strategic program, given the demands on the budget which exists. A new airplane program will be well over \$10 billion and perhaps over \$20 billion. Then there is a collateral issue that you get into when the sorting out of one airplane versus another starts to focus.

In particular, if [deleted]. That is, we minimize the buy of the B-1 or the FB-111 B/C and only buy them up to the point in time [deleted]. It is a working number that we have right now.

Senator WARNER. What would be the comparable number in the III category?

Dr. ZEIBERG. There you have quantum levels, FB-111A's which exist as one package, and F-111D's as another. I suspect it would be a number that corresponds to the conversion of both. We wouldn't go into the conversion of a small number of D's. It wouldn't make any programmatic sense at all.

If we have a two-airplane program, that is a question of carrying things in parallel for some time. At first blush that offers a perception of a program that is twice the size of any one of them, but, in fact, this is not the case. We have laid that out under the assumption that, for example, [deleted]. It looks to me, based on the preliminary work, that the total cost of that combined program, given that it is properly phased and managed, is only 5 or 10 percent more expensive than the program associated with buying [deleted] of one type.

We are working that problem in a lot of detail because it seems to be the best way to exploit the technology available and to enhance the strategic forces.

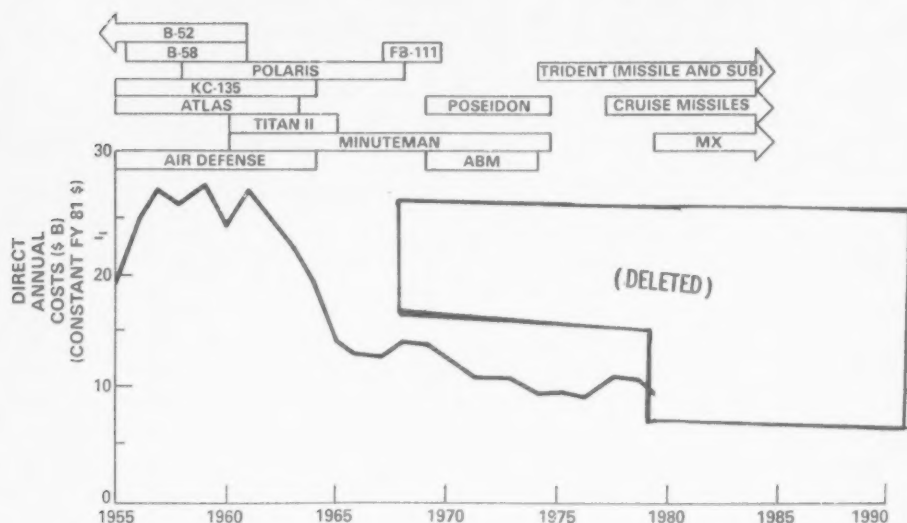
The benefit of having two different kinds of airplanes in the fleet is very profound, because they can be employed for vastly different missions and open up our military capabilities.

Senator WARNER. There is one of our members who has interrupted his appearance before another committee, and I would like to accommodate him. How much longer do you need before you finish?

Dr. ZEIBERG. Just 1 minute.

Senator WARNER. We will give you 1 minute.

STRATEGIC FORCE EVOLUTION



Dr. ZEIBERG. I want to point out one thing on the investment we have made in our strategic forces. This chart shows the direct costs of our strategic program, R. & D. plus procurement. It shows the history of what we did, going back to the 1955 to 1965 time period where we hit a peak of about \$27 or \$28 billion per year. That is in today's dollars, vis-a-vis where we are now at about \$10 billion a year.

You can see the decline. The Soviet costs are shown there, and CIA has some confidence in these Soviet costs in this time period, shown in the late 1960's up to the present. What they do is cost the Soviet program as if it were executed in the United States. The Soviets have always been in the \$20 billion a year range, or twice us for the last decade. Up at the top I have indicated which programs we had underway. We had a large array of programs that provided continuity as we were buying out the B-52's. We had the B-58's coming in. As we were finishing deployment of Polaris A-1's, early in 1960 and 1961, we had the Polaris A-2 in process and so forth. As you go later in time, you see lots of gaps where we stopped and started.

Our strategic forces are all aging. Since they were all built about the same time, we really have to look at the question of block obsolescence. Certainly it would require a large dose of money, such as we spent in the 1960 time period to solve this aging problem. We simply have to go and spend \$25 billion a year for a few years in order to recover the capability that has eroded over these years.

If you stack up the cost of a new bomber and a Trident II, you get up in that \$20 billion a year category out into the late 1980's. It may be an essential step to take.

Senator WARNER. We thank you, Doctor.

Senator Exon?

Senator Exon. Thank you, Dr. Zeiberg.

B-52—PENETRATING BOMBER

Let us go into this bomber bit. We heard early today in the testimony that the B-52 is no longer considered usable by the Air Force as a penetrating bomber; did I hear you correctly?

General BURKE. I would phrase it a little differently.

We value it even today as a penetrating bomber and it is on alert for that purpose right now. We think the B-52's will not be effective for that role by the end of this decade or earlier. That will be a consequence of the Soviet investment in large numbers of shoot-down modern fighters and associated radar.

Senator EXON. Dr. Zeiberg, I think this committee has to be advised a little bit more than it has been, and maybe your plans are to fully advise us in the future. I would like to ask the question: From what you know today, when will the advanced technology for the Stealth bomber be available for production?

Dr. ZEIBERG. I would rather not answer that question in this session, Senator Exon, because in order to do so I would have to get into some of the details which we are keeping at the special classification level.

Senator WARNER. I appreciate that and I have asked that this record contain all of the data regarding the new technology which is in the clear. Are there subreferrals of classification, say, is there a secret level on this which provides an additional quantum?

General BURKE. Yes, sir, and there is an unclassified level, and then there is a level that is secret as are many other things. Then there is a very special level beyond that that we have.

Senator WARNER. We are at the top secret level, Dr. Zeiberg, if you can reply to Senator Exon's question to the extent possible.

Senator EXON. I appreciate your indulgence in that. In deference to the witnesses, if they feel this is not the proper setting to discuss that, I would certainly yield to their superior knowledge.

The complaint that I have on this whole matter is that as one member of this subcommittee, as a junior member of the overall committee, it is very difficult for me to make what I believe to be intelligent or informed decisions unless I know what is going on. I recognize the sensitive area that Stealth is, and I wish it had never come out sometime last year, and it would be better if it had not. It is out and some of us have had different degrees of knowledge about it for some time.

The only thing I want to emphasize, Mr. Chairman, I feel that when we are trying to make an informed decision on which way we go on a bomber, we have to know. I think it is all based on the availability of that airplane which, as far as I know, would be the ultimate in technology that is available to us.

Senator WARNER. You are very well taken on that point.

I am working with those who have the clearance to determine how we advise the members of this subcommittee and the full committee and possibly eventually the Senate regarding the advantages of a new bomber versus delaying that program or actually deferring it altogether and taking a second program which incorporates the Stealth technology and making that the main penetrator that we authorize.

That is a tough decision. I assure you that the Chair and the ranking minority member are working on it together with the chairman and

ranking minority member of the full committee. Precise evaluation is involved. We will acquaint the members of the committee of our work on that in due course.

Dr. ZEIBERG. As part of our report, we will be very explicit about what we believe we can get as a function of the initial operational date. We will be prepared to defend our recommendations by pointing out what you could get in different technologies under different kinds of programs, as a function of what year you are willing to accept the airplane, starting in 1986 or 1987, and so forth.

So your question will be addressed, Senator Exon, and it will be done via that format, so that all of the key decisionmakers in the process will have that information before hand.

Senator EXON. All right. Let me pursue a related area.

I do not have the information available to make my independent judgment upon your recommendations as to where we go on improving our whole area of penetrating bombers, and better air-launched cruise missiles and so forth. Let us go to the matter of the FB-111 stretch versus the B-1 variant, which we are being told is being talked about and wrestled with inside the Pentagon at this time. Is that correct?

Dr. ZEIBERG. Yes.

FB-111 STRETCH AND B-1 VARIANT COST ESTIMATE

Senator EXON. Can you give us today the cost estimate, the differences between the FB-111 stretch as advocated by General Ellis, basically, as opposed to a B-1 variant? I am assuming it is going to cost more to go to a B-1 variant, whether we buy 100 or 200 of those, as opposed to going to the FB-111 stretch.

It has been General Ellis' testimony before this subcommittee that the FB-111 stretch would cost us less and would be available to us earlier than the B-1 variant. Do you agree with General Ellis on that, Dr. Zeiberg?

Dr. ZEIBERG. Well, it costs less, but it is far less capable. Let me give you some indication of the cost range, but also point out that the Air Force is in a proposal evaluation phase. I will give you wide ranges so as not to jeopardize the integrity of that evaluation.

Conversion of the 150 or so F-111's and FB-111's from their present form to the new form would involve costs in the range of \$7.5 to \$9 billion, based on what I have seen of Air Force independent costing.

But also there is a hidden cost associated with the removal of about 75 F-111D's from out of the tactical air force inventory, and one has to replace those. They are very important airplanes. They are the only all-weather, day and night, and therefore most capable, tactical aircraft.

The replacement cost, if you would assume you replace them with F-15's, Strike Eagles—that is the closest competitor—would be about \$5 billion, including acquisition of aircraft and related support equipment.

So you are now in the range of, let us say, from \$12 to \$14 billion for the true cost.

Senator NUNN. If you will yield right here on this point, you are assuming you take that many planes out of the inventory while you

are stretching the FB-111, or are you assuming once they are converted to the new role they would no longer be available?

Dr. ZEIBERG. The latter.

Senator EXON. That was my next question, and tell me why, if we go ahead and stretch the FB-111, would it not be possible to do both of the missions?

STRATEGIC ALERT AND TACTICAL AIR FORCES

Dr. ZEIBERG. They can't remain on strategic alert and also be available for the tactical air forces. Weapon loading and targeting, and operations are totally different and the bases would be totally different. You can't do both missions with the same airplane.

General ALLEN. To make the point a little more specific, in taking the F-111D's and modifying them and putting them into SAC, in the SAC basing, and the alert structure associated with the central strategic forces, we change our basic ability to support the F-111 force and we will have to return a wing of F-111's from Europe. So the real issue is then how we deal with that.

We can't support the present two wings of F-111's in Europe if the F-111D's have moved into the Strategic Air Command Structure.

Senator EXON. If we would go that route, it would be exposing something that you are not at this time prepared to say we should expose?

General ALLEN. No, I am not saying that. Perhaps that is a right way to say it. There are two ways to say it, if we could and do replace it, we are making a judgment that we are prepared to drain our forces in NATO contributing to both theater force balance and conventional bombing, in favor of an update of the strategic forces. That is a trade that we certainly can make. They both have deficiencies, and we can assign our priorities.

The other way to look at it is to say that we cannot really draw down either; we are trying to improve our military capability and not degrade it, and therefore what we must do is restore that tactical capability, at least to the general purpose forces in the NATO arena.

Dr. ZEIBERG. If I may use a metaphor here, you would be filling a strategic bathtub with water taken from the tactical forces. You would be creating a tactical bathtub, so to speak.

Senator EXON. I think I understand the answer to the question.

Dr. ZEIBERG. I was counting up considerably more costs than what you may have heard of in the past, regarding the FB-111 conversions. The true costs are likely in the \$12-\$14 billion category, including the tactical replacements. The B-1 costs, depending upon whether you follow the brochures from industry versus some independent costing by the Air Force, would fall in the \$12-\$20 billion range. Indeed, that is the spread of numbers that are floating around town.

That is for about 100 airplanes, but the B-1 is more than twice as capable as the FB-111 in terms of the weapons it can carry to the strategic ranges. It can carry more than [deleted] whereas the FB-111 can carry about [deleted].

So you then have to compare these on some cost/effectiveness basis, such as what warfighting effectiveness we get as a function of our investment. When you do it that way, I think the numbers I quoted pretty easily show that the B-1 is a far better investment.

Senator EXON. What is that?

Dr. ZEIBERG. A lot better investment than the FB-111B/C.

Senator EXON. It is better and, of course, more costly?

Dr. ZEIBERG. And more costly, yes, but you are getting considerable benefit from the additional investment. Then the other principal issue is, how fast you get one versus the other. Right now it looks as if there is a 1-year difference in availability dates. So one has to question the value of the earlier IOC of the FB-111 in light of its relative deficiencies, given that there is only a 1-year difference in IOC.

Senator WARNER. We really don't know how that thing is going to fly when it comes out of that modification program?

Dr. ZEIBERG. That is right.

Senator EXON. And we don't know how the B-1 variant is going to fly.

FB-111 REWORK

Senator WARNER. I think there are clearer guidelines. We had a picture up here, and perhaps it is worth the Senator's time to look at that, showing the quantum of parts that are reworked in this FB-111. It is a very dramatic portrayal, Senator.

Senator EXON. I haven't seen that.

[Chart deleted.]

Dr. ZEIBERG. The colored areas show the sections of the airplane that are retained. There is a slight difference between the FB-111A's and D's, a little wing tip.

Senator WARNER. All of the white sections are new parts and you can see that the central, big piece in the middle, there are two enormous engines, B-1 engines put in, and all of the aft section is completely replaced.

Senator EXON. What you are saying is that it is essentially a new airplane. Following up on that point, I have been led to believe that if we stretch the FB-111, we would not be in violation of the SALT II agreement, but we would be going to the variant B-1?

Dr. ZEIBERG. There are two issues with SALT II. One is whether we are within the total number of strategic delivery vehicles. U.S. inventories are about 200 to 250 vehicles shy of the 2,250 limit that the treaty specifies, so we are safe. We could add that many delivery systems and still be within that aggregate limit.

In the second area, if a bomber carries cruise missiles, that counts as a MIRV, but we would have no intention of using cruise missiles on either of these airplanes, initially.

That would be a role they would assume in the later part of their lifetime. The B-52G's, and later on the H's, will serve as cruise-missile carriers into the 1990's. We don't have to worry about that.

Senator EXON. We don't have to worry about it, but aren't we back into a situation that many of us are very much concerned about—the Soviets with minor modifications taking the Backfire and making it a truly intercontinental bomber? Aren't we into the same general area of discussion?

Dr. ZEIBERG. It is better for us to do that. It is not constrained by SALT and you can build 30 a year. If he puts cruise missiles on it, he is obligated by virtue of these agreements we have made, or at least the backdoor agreements, to count those as MIRV systems.

It would be to our benefit if he went ahead and did that. I think he is too smart to do that, by the way.

PENETRATE SOVIET DEFENSES

Senator EXON. I have just one other question, Mr. Chairman.

Aside from the other features—and I recognize that you people who know aircraft are in much better position to make this evaluation than am I—but aside from all of the other features of the proposition of the FB-111 stretch and the B-1 variant, would they both be able to penetrate Soviet defenses, and if so, for how long? And would the B-1 variant be able to penetrate the Soviet defenses for a longer period of time than would the FB-111 stretch?

Dr. ZEIBERG. Do you want to solicit opinions from all of us? Do you want to start, General Allen?

General ALLEN. I think with the [deleted].

I would be more optimistic about that general question than General Ellis and SAC analysts are.

I can make a couple of comments and I am not sure how helpful I will be. With respect to the FB-111 and B-1 and their ability to penetrate, [deleted].

Now, when we project ahead into a [deleted]. It has been our experience over the years that the larger airplane with higher power availability and higher volume makes it easier to keep up with the ECM modifications necessary to constantly stay up with the Soviet threat. So I would think that inherently, just because of size, the B-1 would be able to penetrate Soviet defenses further into the nineties. It is very difficult for us to guess how far into the nineties.

We are making a significant extrapolation when we say that the Soviets will have this postulated threat about the middle of the nineties, because it involves the construction of [deleted] Soviet Union and a very broad scale of [deleted] which we are now beginning to understand. But nevertheless it is prudent to plan on that.

If, as I think it probably does, that sophisticated capability describes the Soviet system into a significant portion of the nineties, then I think both airplanes will be able to penetrate if we do our job correctly and well into that time period. Therefore I am optimistic about it.

I would like to say one more thing if I may. Obviously one of my responsibilities is to support as vigorously as I can the combat needs as seen by the commander of SAC. Therefore I would like to put his views and mine in a little bit of perspective. General Ellis' primary concern is that viewing the sophisticated threat that he anticipates he will have to face in the nineties, he wants to ensure that all of the technological means possible are at his disposal. He thinks, therefore, that it is very important that this country move rapidly toward the most advanced technology possible to apply against those Soviet defenses in the nineties and that really is his first conclusion.

His second conclusion is that if we apply a full amount of funding to that approach, we may find ourselves budget limited in what else we do. So his preference for the FB-111 is entirely focused on his

view of the lower cost and the phasing of that program cost in terms of the proper allocation of funds across the strategic programs in the coming years. I understand that and I am working very hard to be sure that I consider his views on the needs of the strategic forces very carefully. Where we differ it is primarily because we see different ways in which the programs can be laid out in their acquisition phase over the next couple of years.

INCREASING ALERT FORCE

Senator EXON. Well, General Allen, let me follow that up with a question that I want to clarify for the record as best I can. Increasing the B-52 alert rate would cost between \$2 and \$4 billion and take 2 to 4 years according to General Ellis. The Congressional Budget Office states that taking this step would add about [deleted] weapons to the available alert forces. Are these statements accurate according to your analysis? If you would like to comment on that, Dr. Zeiberg, I would appreciate it also.

General ALLEN. First of all, increasing alert force to [deleted] percent—

Senator WARNER. Did the Senator say [deleted] percent or was it [deleted] percent?

General ALLEN. I think that number would be consistent with the increase of weapons cited. I can't exactly check it.

Senator WARNER. Let us get our baseline established first. If I understood the question, it was increasing it from the present level of [deleted] is that correct, Senator.

Senator EXON. I think that is about the basis on which General Ellis was estimating it.

Senator WARNER. Which are we discussing here?

General ALLEN. We are presently at [deleted] and we are frequently asked the question about going to either [deleted]. The first thing to say is, of course, this changes the number of weapons on alert and it does not change the total number of weapons in the bomber force when we generate that force, that is when we place the force at higher states of alert. So the first thing to know is that during periods on tension between ourselves and the Soviets, as have happened in many occasions in the past, and might happen again during situations associated with Southwest Asia or Poland for example, we can generate the B-52 force to higher levels of alert.

We can elect to raise the alert status of the SAC forces to [deleted] percent and do that within a matter of hours and then remain in that situation for periods of times measured in several months. So we already have that kind of capability inherent in the present SAC forces. Now the question of whether it is worthwhile going from [deleted] percent for day-to-day alert indefinitely and incurring the kinds of costs that would be required is one that we debate among ourselves all of the time, and I don't have any pat answer for you. We generally have concluded that the [deleted] percent number, which is by far the most economical day-to-day alert rate, is satisfactory in the present balance of Triad. But I will admit there are counter-arguments to that.

PERSONNEL AND SUPPORT COSTS FOR HIGHER ALERT RATES

Dr. ZEIBERG. I tend to agree. I think there is also a point you should keep in mind, that higher alert rates means a larger demand on personnel. That brings in another dimension of the military problem. When we generate now we are taking people who are off doing other assignments or off duty and putting them in the aircraft. If you want to maintain a [deleted] percent alert rate there will be a significant increase in the number of crews that would have to be available, and along with that some other support people.

It is a complex problem. One view we have always had was that committing to a higher alert rate, and not being able to sustain the personnel and support costs demands that go with it, requires having to take it out of your hide from all of the other areas.

Senator EXON. I don't think we are talking about taking it out of your hide. That is what the \$2 to \$4 billion was.

General ALLEN. If we made it a policy to have a high alert rate we would have to be collectively making a judgment that such funding would persist as long as necessary. That is a difficult thing to perceive when you consider the history and success we have had in maintaining the support and logistics budgets at proper levels. We are now paying the price for having dipped into that kitty in the past because it has been treated as a second-class citizen relative to the weapons acquisition. So there might be a pretty big trap waiting for us, if we restructure our forces on the basis of future commitments to support costs and personnel levels.

Senator EXON. You could make the same argument when you talk about the B-1 variant, couldn't you? You are going to have to have more crews.

Dr. ZEIBERG. If you add airplanes, you will need more crews and more support.

Senator EXON. Of course you are right at the heart of the problem that many of us are concerned about, especially on the Manpower Subcommittee. We are wondering whether we are going to get all of the manpower to man the ships and all of the things we are taking out of mothballs, and we have a deficiency now of petty officers. Where are we going to get the manpower? That is a tremendous problem and I am not sure we are facing it as forthrightly as we should.

General BURKE. As a personal observation on that. Since I was in SAC when we had a [deleted] percent alert rate and I was still there when we went to the [deleted] percent alert rate, the most salutary thing that happened to SAC during my time was that reduction in alert rate. At the higher rates you have to have a larger number of crews to fill those alert lines, and that means they have to fly additional sorties and hours, and you had a lesser number of airplanes available to do it because you have a fixed number of airplanes and they are not available to you for training. So it tended to strain the command. We were chronically strapped for available airplanes and spare parts and people to fly them. We were somewhat better off in a day-to-day alert situation. Against a bolt from the blue Soviet attack we would be in a better position. But, in my opinion, once we went to the lower rates we were a whole lot better prepared

to fly the mission if we had any degree of warning at all. That is the kind of trade you have to make. How likely it is that you will get a bolt out of the blue with no warning? With any increased tension, you can have [deleted] percent alert and [deleted] percent alert and SAC can do that now.

Senator EXON. Thank you.

Senator WARNER. I am going to ask two questions and then we will put questions in the record and the record will be left open until 5 p.m. for the benefit of Senators who are unable to attend. First I would like to make a general observation.

I have been around, in and out of the Pentagon, for a dozen or more years now and I think that this competitive analysis between General Ellis and yourself and other seniors in the Pentagon is a very healthy debate. I think it has been beneficial to the Senators in our defense analysis on the whole and I encourage it. I also encouraged my seniors to speak out in debate and I respect you as Chief of Staff for in turn respecting the viewpoints of your subordinates, and to come before us as gentlemen and professionals and air those debates.

STEALTH TECHNOLOGY FUNDING OPTIONS

Let me clarify in my own mind your difference of opinion with General Ellis. No. 1, he is looking at the pragmatic history of defense spending here in the United States; namely, that once you get a major program going it is awfully hard to transition to a second. Attaching significance to the evolution of Stealth technology he is of the opinion that we should minimize this initial investment for a penetrating bomber in the hopes that Stealth will come along within a timeframe so that we can have a transition and fewer dollars, is that No. 1?

General ALLEN. I saw it a little bit differently. General Ellis feels very strongly as do I, that we have no choice but to assign first priority to the MX program. Second, he feels, as do I, that we have no alternative but to complete the ALCM program on the B-52 with vigor and as much confidence as we possibly can.

Third, he believes, as I do, that this country must proceed with the advanced technologies, with the Stealth technologies in a vigorous way and I think he would probably say, not fund-limited way. That is, we should proceed at whatever pace the technology and the practical opportunities offer.

And so when he has done those three things, then he basically says "I am not sure what the country is prepared to spend on this strategic system in addition, and I think there is a near term problem." Then he says, "Therefore I want to be sure that this low cost option is fully considered."

My disagreement with him is only that while he and I are agreed throughout most of that, when we get down to making the trades between advanced technology and the FB-111 and B-1's, I wish to do that and I am now doing it in a way that takes into account a broader set of considerations. I am not yet sure that this country will not be well advised to proceed with the B-1. I think the country may

very well be advised to proceed with that, even recognizing the near term cost advantage of the FB-111 and the desirable features of more advanced technology for later on.

Senator WARNER. And the time difference between the FB-111 program, and I realize they haven't been finalized, but has that narrowed in the year in which we have looked at this? I think a year was used today, and has that period of time narrowed now?

General ALLEN. Some of that has been due to the fact that we have concluded that the initial SAC views of making the FB-111 mode as simple as possible would not be desirable. For instance, they weren't going to change much of the avionics and we believe we need to make some additional changes.

Senator WARNER. I have two quick questions. What more can be done to improve the capability of long range bombers to perform the sea control mission?

General ALLEN. I think there is a good deal that can be done. We presently have very limited antiship capability, mainly by using gravity bombs on the B-52, but they don't provide any standoff capability that would be required for effective attack against any kind of a defended group of combatants of the Soviet Navy, so we are working with the Navy on programs like MRASM, and possibly Harpoon. These are programs in which we would hope to develop weapons with sufficient standoff capability that the long-range bombers will be a significant asset to the navy sea control mission.

Senator WARNER. Second, how confident are you that each of the near term bombers and variants being considered, the B-1 and FB-111 stretch, that their mission could be met without delay with our industrial base for the Nation as a whole?

General ALLEN. Sir, I don't believe that the schedules which have been discussed are limited by the industrial base. I think we can meet those schedules.

Senator WARNER. Thank you. Additional questions will be submitted to you, please submit your answers for the hearing record.

[The questions submitted, with answers supplied, follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN W. WARNER, ANSWERS SUPPLIED BY GEN. LEW ALLEN, JR., USAF, CHIEF OF STAFF, U.S. AIR FORCE

CHART UPDATE

Senator WARNER. General Allen, could you update the attached chart, and supply for the record.

General ALLEN. (See attachments.)

STRATEGIC AIRCRAFT CHARACTERISTICS

Characteristic	B-1 variant	B-1 restart	B-52G	B-52H	FB-111A	FB-111B/C
Max takeoff wt ^a	477,000 lb.	395,000 lb.	488,000 lb.	488,000 lb.	114,300 lb.	148,000 lb.
Max inflight wt.	477,000 lb.	421,000 lb.	488,000 lb.	488,000 lb.	114,300 lb.	155,000 lb.
Takeoff dist (MGTOW)	8,300 ft.	7,500 ft.	10,700 ft.	9,900 ft.	7,400 ft.	5,200 ft.
[Deleted.]						
Cruise speed (high)	0.72 Mach	0.72 Mach	0.77 Mach	0.77 Mach	0.77 Mach	0.76 Mach.
Penetration speed (low)	0.85 Mach	0.85 Mach	0.53-0.55	0.53-0.55	0.85 Mach	0.85 Mach.
Withdrawal speed (low)	0.42 Mach	0.55 Mach	0.55 Mach	0.55 Mach	0.55 Mach	0.55 Mach.
Max nuclear payload (B-61/SRAM)	30/38/30*	30/24/0	12/20/20	12/20/0	6/6/0	12/12/0.
ALCM.						
Max conv payload (WK-82 500-lb bomb)	142*	84	27	27	36	52.
Range (high, no refuel)			6,600 nm	7,900 nm	3,200 nm	
Range (high, 1 refuel)					4,300 nm	
Range (SLOP, no refuel)			4,500 nm	5,900 nm	2,900 nm	[Deleted.]
Range (SLOP, 1 refuel)					5,200 nm	
[Deleted.]						
Offensive avionics	TBD	APQ-144, APQ-146, FLIR.	OAS/CM1	OAS.	APQ-114, APQ-134, AJN-16, AJN-218.	TBD.
Defensive avionics	ALQ-161 monopulse terrain bounce, ALQ-153 comm jammer.	ALQ-161, ALQ-153 terrain bounce.	ALQ-117 improved, ALR-46.	ALQ-153, ALQ-122, ALQ-155, ALR-82, ALQ-137, ALE-28, AAR-34.	ALQ-XXX, ALQ-153, ALE-40 comm jammer.	

Footnotes deleted.

The negotiations with the LRCA contractors over the costs, schedules, and configurations of the candidate aircraft is on-going. The results of these negotiations will be released by 1 June 1981. Until that time, data on the first aircraft delivered, IOCs, FOCs, Program Unit Costs, Total Program Costs, and configuration will not be available. Offensive and defensive configurations presented are typical, but should not be considered firm.

SURVIVABILITY MECHANISM/IMPORTANCE OF SPEED

Senator WARNER. The proposed B-70 bomber would have stressed high altitude and high speed for its survivability. The B-1 bomber had both high altitude supersonic speed and low altitude penetration capability. B-52 bombers carry powerful radar jammers, complex electronic countermeasures and have automatic tail guns for defense. How important is speed to the survivability of manned penetrating bombers?

General ALLEN. There are many elements that contribute to the survivability of a modern strategic bomber. These include penetration speed, altitude, observables (radar and infrared), and electronic countermeasures. Speed is important to the survivability of a manned penetrating bomber, but it is speed working in combination with the other elements that make the bomber survivable.

SUCCESS OF ECM

Senator WARNER. How successful have electronic countermeasures been in the past and what success do you predict for electronic countermeasures in helping future manned bombers penetrate?

General ALLEN. It is extremely difficult to quantify the military effectiveness of electromagnetic combat (EC), which includes electronic countermeasures; however, we can point to actual experiences that indicate the military worth of EC during specific periods or events. One such example is drawn from our Vietnam experience between 1966 and 1968. [Deleted.]

As our systems become more responsive to threat developments, EC will help future long range combat aircraft successfully penetrate a wide variety of defensive environments by combining [deleted]. We have every reason to believe these new systems will provide adequate bomber protection against projected threats.

IMPORTANCE OF LOW RADAR CROSS-SECTION AND LOW IR

Senator WARNER. How important are low radar cross-sections and low infrared signatures to a penetrating bomber?

General ALLEN. Radar cross-section (RCS) and infrared (IR) signatures are similar phenomenon that operate at different wave-lengths in the electromagnetic spectrum. Each characteristic signature is important because it can lead to enemy detection of our penetrating bomber force. [Deleted.]

BOMBER DEFENSE PROSPECTS

Senator WARNER. What are the prospects of future manned penetrating bombers defending themselves with air-to-air missiles or attacking Soviet AWACS aircraft with long-range ASALM or SRAM derivatives?

General ALLEN. Of the near-term candidates, the FB-111B/C would be less likely to field a lethal defense system because of size limitation. A B-1 variant would be more adaptable to self-defense systems because of its larger payload and avionics capabilities. Aside from the FB-111B/C size limitations, the principal determinant in equipping a new bomber with ASALM or SRAM derivatives will be progress in self-defense technology.

RESULTS OF BOMBER PENETRATION EVALUATION STUDY

Senator WARNER. The Congress has been funding the Bomber Penetration Evaluation study for several years including tests of sophisticated countermeasures on B-1 bomber Number 4. General Allen, could you summarize for this Subcommittee the results you have received from the Bomber Penetration Evaluation Study?

General ALLEN. The interim Bomber Penetration Evaluation status report included four findings: [Deleted] Such limitations would be corrected in any follow-on production of the system.

USEFULNESS OF ECM

Senator WARNER. General Allen, what does the Bomber Penetration Evaluation Study tell us about the usefulness of electronic countermeasures (ECM) to aid penetrating bombers?

General ALLEN. The Bomber Penetration Evaluation interim summary indicates that [Deleted]

ANTICIPATED ALCM SURVIVABILITY

Senator WARNER. General Allen, does the Bomber Penetration Evaluation Study tell us anything about anticipated survivability of our air-launched cruise missiles?

General ALLEN. Air-launched cruise missile survivability is not addressed in the Bomber Penetration Evaluation.

SCHEDULE FOR BOMBER DECISION

Senator WARNER. On March 4th proposals for a near-term bomber were received by the Air Force. The Congress requested a report on a new manned strategic bomber with recommendations by March 15. Secretary Weinberger has said that he may not be able to give us a decision until mid-summer. To me, mid-summer means as late as July. General Allen, when will the Air Force have sufficient data to make a recommendation on the bomber?

General ALLEN. The Air Force plans to make its recommendation on the candidate strategic aircraft to Secretary Weinberger by May 1, 1981. I expect Secretary Weinberger to make his decision and report formally to the Congress by June 1, 1981.

SCHEDULE FOR BOMBER REPORT

Senator WARNER. On March 4th proposals for a near-term bomber were received by the Air Force. The Congress requested a report on a new manned strategic bomber with recommendations by March 15. Secretary Weinberger has said that he may not be able to give us a decision until mid-summer. To me, mid-summer means as late as July.

Dr. Zeiberg, when will the actual Bomber Study be complete and how long will be allocated for reviews before submitting the report to the Defense Secretary and the White House?

General Allen, Dr. Zeiberg, General Burke, why are you unable to meet the Congressionally mandated report deadline of March 15?

General ALLEN. Although we have made substantial progress in completing the report on the Long Range Combat Aircraft, and the Department of Defense has provided an interim report to the Congress, we are still working on the detailed cost analyses for each candidate aircraft. This is an extremely important and time-consuming process, since the cost data will impact heavily on the production pace and final capabilities of the aircraft selected.

The initial, formal cost data on the near-term candidate aircraft were supplied to the Air Force by industry on March 4, 1981. We plan to complete this study and present a formal recommendation to Secretary Weinberger by May 1, 1981. We expect him to provide his recommendations to the Congress by June 1, 1981.

Dr. ZEIBERG. The Secretary of Defense is committed to a 1 June 1981 decision date for the new bomber. Most of the significant data will be available before the end of April and the date submitted to the Defense Secretary during May 1981.

An interim status report was submitted to Congress during March 1981 which primarily outlined needs, issues and selection criterion. A final decision is targeted to 1 June 1981 for the following reasons: (a) a competitive cost situation has been maintained among the selected candidates. A June 1981 decision data will permit negotiation of high value contracts while a competitive atmosphere is maintained thus permitting more accurate costing information; and (b) sufficient time is required for this administration to review the long and short term strategic bomber options within the overall budgetary constraints.

FB-111 STRETCH/ADEQUACY OF WING STRUCTURE

Senator WARNER. General Ellis, the Commander of SAC, has recommended that 89 F-111D and 66 FB-111A aircraft be modified to create a near-term strategic bomber force of 155 FB-111B/C aircraft. This is the least costly bomber option and offers the earliest IOC. The range/payload capability of the FB-111A

would be doubled. General Ellis has testified that the FB-111B/C would make a valuable contribution to U.S. strategic forces.

The FB-111 is an outgrowth of the old TFX program and from the beginning there was concern about the strength of the wings and wing carry through box. How high is the risk that the wing structure in a stretched FB-111B/C would be inadequate?

General ALLEN. We asked a group of aeronautical engineers to evaluate the wing structure of this proposed modification to the FB-111A and F-111D aircraft and they have assessed the technical risk for this modification to be low. They also found little, if any, risk involved in the strength of the wing carry through box.

SEVERITY OF F-111D LOSS

Senator WARNER. Critics of the FB-111B/C program argue that modification of the F-111D aircraft would take valuable assets away from TAC. However, the F-111D aircraft has had severe reliability problems with their electronics and the Air Force has considered eliminating them from the inventory. How severe would be the loss of the F-111D aircraft from TAC and could that loss be made up by the diversion of other resources including SAC aircraft?

General ALLEN. During development of the FY 81 Budget, we thoroughly reviewed the problems associated with the F-111D. One of our options at that time included retiring the aircraft. However, our review found that investments in reliability improvements were beginning to increase F-111D operational rates and readiness problems. In fact, during a recent overseas exercise, the F-111D achieved an average mission capable rate of 88.4% and a sortie rate well in excess of current wartime tasking. The review also reaffirmed the vitally important night and all weather operational capabilities of the F-111D.

Removing the F-111Ds from TAC would result in the loss of 25% of the Tactical Air Forces (TAF) night/all weather capability. This would be especially critical since the TAF has serious shortages in this area, even with the F-111's. The capability void caused by such a transfer from TAC could not be readily remedied. An additional factor affecting F-111D withdrawal from TAC would be the resulting force/aircrew imbalance with two wings of F-111s in Europe and only one in the United States. This would cause serious training and manning problems and could well lead to the return of one of the F-111 wings to the U.S.

The FB-111s in SAC are committed to the Single Integrated Operational Plan (SIOP). Their use in theater combat operations as F-111D replacements would require the Joint Chiefs of Staff (JCS) to release them from SIOP tasking.

B-1 MODIFICATIONS/CMC

Senator WARNER. The original B-1 was designed as a supersonic, penetrating bomber using a design which went into production five years ago. Since then new technologies have evolved and the B-1 is being considered also as a cruise missile carrier. Depending on configuration the B-1 could carry from 20 to 30 cruise missiles.

General Allen, should the B-1 be modified to carry cruise missiles? And, if so, how many and at what cost?

General ALLEN. The various characteristics of the candidate strategic aircraft, including cruise missile carriage, are being analyzed in the Joint Bomber Study. The exact cost of modification to the original B-1 design to enable it to carry as many as 30 cruise missiles is currently under evaluation and will be available in the final report due to the Congress not later than June 1, 1981.

CHANGES MADE TO B-1

Senator WARNER. What changes to avionics, electronics, and airframe does the Air Force desire to make in the B-1 if we should proceed with that option?

General ALLEN. Although the configuration recommendations for the B-1 variant are not yet final, the major changes from the original B-1 design would include the following:

Offensive avionics.—Add cruise missile launch capabilities; upgrade radar and radar and navigation system.

Defensive avionics.—Add [deleted].

Airframe.—Reduce wingsweep and improve wing fairing design; beef up landing gear for heavier loadings; incorporate signature reduction design changes; enlarge weapon bay.

Engine.—Change inlets to reduce radar cross section (also improve reliability/-maintainability); simplify nozzles.

B-1 COST COMPARISONS

Senator WARNER. General Allen, how does the cost of the B-1 variant preferred by the Air Force compare with the cost of producing the original design or producing a more austere design?

General ALLEN. The analysis now underway will provide a cost and configuration audit track between the original B-1 design and the B-1 Variant. We expect our analysis to be complete by the middle of April and will present it along with our recommendations on bomber alternatives to Secretary Weinberger by 1 May. The complete cost analysis will be available when the final report is formally sent to the Congress on 1 June 1981.

B-1 SCHEDULE

Senator WARNER. General Allen, with the changes that the Air Force would like to see made in the B-1 what is the impact on the schedule and when could an IOC be achieved?

General ALLEN. None of the modifications planned for the B-1 would have an adverse impact on achieving an early IOC date. There is little if any difference between the IOC for an unmodified B-1 (similar to the one cancelled in 1977) and a modified version.

BOMBER AFFORDABILITY

Senator WARNER. The Defense Department is faced with the need to modernize strategic, conventional and readiness forces and solve expensive manpower problems all at the same time. The Air Force itself has major near-term programs such as the M-X and the C-X along with the on-going ALCM program. General Allen, are you persuaded that the Air Force can afford a new bomber as well as M-X and C-X and your other programs? And, if so, can you show us the funding profile that would make that possible?

General ALLEN. There is no doubt that simultaneous funding of several major strategic modernization and readiness programs will stress the Air Force budget. I am convinced that this nation can afford to make available the resources to fund the needed force improvement, including the programs you mention. The need is evident and pressing. I do not believe we can afford not to fund these critical programs.

As to funding profiles, the Department of Defense has focused attention primarily on the substantial revisions to the fiscal year 1981 and fiscal year 1982 budgets. We are addressing out-year funding profiles and will be discussing these with DOD over the next few weeks.

USE OF FUNDS

Senator WARNER. General Allen and Dr. Zeiberg, the new Administration has a wedge for \$2.5 billion in fiscal year 1982 for a new bomber. Can you explain to us what that money would be for?

General ALLEN. Of the \$2.423 billion requested, \$302 million would be for RDT&E activities while \$2.21 billion would be used for the fabrication of the first lot of aircraft, long lead requirements for follow-on aircraft lots, nonrecurring expenses such as unique tooling, set-up costs, vendor qualification, and procurement of initial spares.

Dr. ZEIBERG. The requested \$2.5 billion of fiscal year 1981 funds would be used for development and deployment of the new multi-role bomber as specified by Congress last year. Items such as research, development, long lead procurement and production tooling, and test equipment would be funded. This amount of funds is adequate to protect any of the candidate options such as FB-111B/C, B-1, B-1 Variants or an Advanced Technology Bomber (ATB). A final decision on aircraft selection is expected by 1 June 1981.

FUNDING CONSTRAINTS/ALTER PLAN

Senator WARNER. General Allen, if funding constraints would not permit you to proceed with all of the major Air Force programs, how would you alter your investment plan, and would you forego any programs?

General ALLEN. Our current program was constructed based upon funding constraints, since the funds available were not sufficient to meet all requirements. In our budget process, programs are funded on a priority basis with the prioritization determined by our overall military strategy and objectives. Changing our investment plan would be a function of the extent of funding constraints imposed. Whereas a minor reduction could result in the cancellation of a lower priority program or a stretch-out of several others, a major reduction might require us to reassess our overall strategy and restructure our entire investment plan to meet the reduced funding level.

MISSION OF LORING AFB

Senator WARNER. Will the mission of Loring Air Force Base, Limestone, Maine, change substantially if and when the Air Force decides to replace B-52G model bombers with B-52D model bombers?

General ALLEN. No. Loring AFB will continue to function as one of our key Strategic Air Command bases. The proposed realignment is designed to more effectively position the various model B-52 aircraft for their Single Integrated Operational Plan (SIOP) and contingency roles.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY GENERAL LEW ALLEN, JR., USAF, CHIEF OF STAFF, U.S. AIR FORCE

ROLE OF BOMBER

Senator THURMOND. General Allen, what is the role of the manned bomber in the Triad, as opposed to the cruise missile B-52 platform?

General ALLEN. Manned strategic aircraft on penetration missions can execute preplanned options and provide quick response to changing circumstances due to the presence of on-the-scene human judgment. They can also perform real-time, all-weather damage assessment during a protracted conflict and strike missions against imprecisely located targets. While the B-52 carried cruise missile can successfully strike pre-planned fixed targets, the penetrating bomber can employ a family of weapons and tactics to meet a range of changing threat and targeting requirements.

STRATEGIC BOMBER REQUIREMENT

Senator THURMOND. What is the requirement for the strategic bomber and how do you propose we meet it in the 1980s?

General ALLEN. As part of our strategic Triad, a manned penetrator for the SIOP mission is a critically important and versatile weapon system. The B-52 is rapidly approaching the end of its useful life as a manned penetrator, although it will remain an effective cruise missile carrier for many years. Moreover, we need a manned strategic aircraft with the capability and flexibility to participate in conventional engagements, as well as SIOP operations that involve attacking less than precisely located targets. As such, manned bombers are unique in their capability to support U.S. national security objectives across a wide range of possible conflicts—from a responsive show of force, to conventional conflict, to global nuclear war.

We addressed these requirements in the Congressionally-directed study of bomber alternatives. In that study we evaluated both near and longer-term candidate aircraft in order to assist the Secretary of Defense in making a recommendation to Congress on the most appropriate aircraft.

RISKS WITH B-52 AIRFRAME

Senator THURMOND. General, what risks do we take with the B-52 airframe and why should we go forward with this program if we build an interim bomber?

General ALLEN. The risks associated with the B-52 airframe were extensively studied in preparing the current modernization program. We found that the structural life of the B-52 will exceed the year 2000. We will continue to monitor the B-52 structure to stay ahead of any potential problems.

The B-52 force is being modified in order to allow it to continue to serve as a penetrating bomber and/or launch platform for cruise missiles. B-52s will also continue to be needed for conventional bombing missions and for force projection. Until such time as a new, long-range combat aircraft is available, a modernized B-52 force will be a vital part of our strategic deterrent posture.

STEALTH BOMBER IN THE 1980'S

Senator THURMOND. What is your opinion of General Ellis' statement that if we can build only one bomber in the 1980s it should be the Stealth bomber?

General ALLEN. I share with General Ellis the belief that over the next several years the Nation should vigorously pursue efforts to acquire an advanced technology bomber. General Ellis and I also agree on the need for prompt measures to maintain an adequate strategic nuclear balance. The choice of the specific new bomber program needed to enhance both our strategic and conventional force projection capabilities is being addressed in the current OSD-Air Force bomber study in which both General Ellis and I are participating. The Air Force plans to make its recommendations to Secretary Weinberger on this matter in late April and Secretary Weinberger has said that the Administration will present its new bomber program to the Congress by 1 June.

WEAPONS REQUIRED

Senator THURMOND. What weapons would be required to support a B-1 type bomber in the 1980s and beyond?

General ALLEN. In the SIOP role, variable yield gravity weapons and short and long-range air-to-ground missiles will continue to provide the best weapons mix. Additionally deployment of standoff terminally guided weapons would enhance the capability to strike imprecisely located or mobile targets. In the conventional role, general purpose bombs, standoff weapons, cluster munitions, and/or sea mines would be used.

NUMBER OF INTERIM BOMBERS

Senator THURMOND. How many interim bombers would you recommend and how would they be utilized?

General ALLEN. The number of aircraft recommended will depend upon which alternative aircraft is selected. As you are aware, the Department of Defense analysis of bomber candidates is nearing completion and the final recommendations will be provided to the Congress in June 1981. Should the FT-111B/C be selected, the number would be limited by available airframes to approximately 150 aircraft.

We will continue to evaluate the evolving threat to determine the total number required as well as to pace the development of stealth technology. Either near term candidate would be utilized primarily in the strategic penetration role. Additionally, they would be available to support a wider range of missions, including delivery of conventional weapons, when required in a worldwide protection role.

NEW TECHNOLOGY

Senator THURMOND. What new technologies can you foresee which may inhibit or enhance a manned strategic bomber's ability to penetrate Soviet defense?

General ALLEN. Two technologies critical to the future enhancement of a manned strategic bomber's ability to penetrate Soviet defenses are reduced observables and electronic countermeasures (ECM). In particular, there is considerable synergism in the combination of effective reduced observables and ECM.

As the Soviets deploy new air defense aircraft possessing radars similar in capability to the radars in our own F-14/F-15 aircraft, the problem of developing effective ECM becomes more difficult. However, if the radar and infrared signature can be reduced, the ECM choices are more numerous. Thus, it is the combination of low observables and effective ECM that will permit acceptable bomber survivability in the face of the increasing Soviet air defense threat.

STEALTH TECHNOLOGIES APPLIED TO B-1

Senator THURMOND. To what degree can the Stealth technologies be applied to a B-1 type bomber?

General ALLEN. Since there are a number of separate technologies involved in the development of an advanced technology bomber, there is no question that some of these technologies would be applicable to a B-1 type bomber. The degree to which they can be applied is a function of their availability in relation to given bomber production schedules and appropriations to the B-1 type aircraft.

FUNDING OF B-1 DELAY STEALTH

Senator THURMOND. Would the funding of the B-1 type bomber tend to delay the arrival of a Stealth type bomber?

General ALLEN. The pace of development of an advanced technology bomber will be guided both by technological process and by the specific funding applied. We are addressing the cost and phasing implications of the various bomber alternatives in the Joint Bomber Study and expect complete cost analysis to be available when Secretary Weinberger sends the final bomber report to the Congress on 1 June 1981.

EARLIEST DEPLOYMENT OF STEALTH

Senator THURMOND. Based on your knowledge today, when would you guess would be the earliest possible deployment of a Stealth-type bomber?

General ALLEN. The earliest possible deployment of an advanced technology bomber is a function of the degree of advanced technology you incorporate into the aircraft. "Stealth" is a family of technologies that contribute incrementally to the overall result. Since these technologies mature with time, the question is not one of the earliest possible deployment, but rather how much stealth capability can be secured by any given date. We are presently working on the question of what can reasonably be expected to be available at any given point in time. The Air Force will be providing its recommendations on this question and other new bomber alternatives to the Secretary of Defense at the end of April. Secretary Weinberger has said that the Administration will present its new bomber program to the Congress by June 1, 1981.

QUESTIONS SUBMITTED BY SENATOR SAM NUNN, ANSWERS SUPPLIED BY GENERAL LEW ALLEN, JR., USAF, CHIEF OF STAFF, U.S. AIR FORCE

TARGETS FOR BomBER-DELIVERED WEAPONS

Senator NUNN. Under the countervailing strategy and current SIOP, what are the primary targets for bomber-delivered weapons? Would these be the same for the B-1?

General ALLEN. Under the current SIOP, bomber-delivered weapons are planned across the entire target spectrum. Strategic weapon systems are thus targeted to optimize their unique capabilities and to hedge against the unforeseen failure of other components of the Triad. Today, however, we have very [deleted.]

While the strategic target allocation for the long range combat aircraft (LRCA) will be similar to that for the B-52, we can expect improvement both in target coverage, including [deleted] and target damage. We also expect greater effectiveness in the trans- and post-SIOP environments due to the increased survivability of the LRCA. This enhanced capability should support expanded target coverage and improved damage expectancies in non-SIOP nuclear and conventional roles as well.

FORCE PLANNING

Senator NUNN. What planning factors are taken into account when deciding on any bomber force?

General ALLEN. We consider a number of factors in determining bomber requirements. Principal among these are present and expected enemy air defense capabilities; nuclear and conventional roles, such as aircraft, would be called upon to perform; the enemy target base, including mobile and imprecisely known targets, as well as fixed sites; and capabilities of alternative bomber designs, including per-launch survivability, penetrability, weapons load, and range. Additionally, when planning a total force, production availability, flexibility of mission employment, and life cycle cost are factors which must be assessed.

DELIVERY ASSESSMENT

Senator NUNN. What is your assessment for 1985 and 1990 of the (1) prelaunch survivability; (2) penetration of enemy air defense; (3) penetration of enemy terminal defense; and (4) destruction potential for the B-1 and FB-111?

General ALLEN. The Department of Defense is nearing completion of an extensive analysis of bomber candidates which addresses the four criteria you have identified. An interim report will be provided to the Congress shortly, and the Secretary of Defense plans to submit a final report in June 1981.

BOMBER CHARACTERISTICS

Senator NUNN. What should the characteristics be of any new bomber?

General ALLEN. Congress directed that the new bomber must be able to perform as a conventional bomber, cruise missile launch platform, and nuclear weapon delivery vehicle in either a tactical or a strategic role. To perform these missions with maximum effectiveness, the Long Range Combat Aircraft should be able to fly long distances; carry large, diversified payloads; provide self-contained target acquisition and weapons delivery; and defend itself reasonably well against sophisticated air defenses.

COMPARISONS OF B-1 AND B-52G-H

Senator NUNN. What are the comparisons of the candidate B-1 and the B-52G/H models in terms of speed, low altitude capability, radar cross-section, payload, and pre-launch survivability?

General ALLEN. Here are the comparison data you requested:

	B-1 variant	B-52G/H
Speed:		
Cruise.....		
Penetration.....		
Maximum.....		
Low altitude capability.....		
Radar cross-section (frontal).....		
Payload: ¹		
MK-82 (500 lb bomb).....		
MK-84 (2,000 lb bomb).....		
B-34/B-61 (nuclear bomb).....		
SRAM.....		
ALCM.....		
Prelaunch survivability (PLS):		
Overpressure.....		
Gust loading.....		
Thermal.....		
[DELETED.]		

[DELETED.]

¹ Should not be construed to mean all weapons can be carried simultaneously.

TRIAD COSTS

Senator NUNN. What portion of the Triad is the most expensive to operate and maintain?

General ALLEN. The submarine and bomber portions are far more expensive to operate and maintain than the ICBM leg. Direct O&M and personnel costs, as reflected in the fiscal year 1982 President's Budget for each portion of the Triad, are as follows:

	Millions
Bombers.....	\$1, 891
Missiles.....	345
Submarines.....	1, 627

BOMBER BASING

Senator NUNN. What does the threat to the bomber force from an SLBM attack do to the probability to penetrate assessment and would any new strategic penetrator be based inland? What are the trade-offs here in terms of flight-to-target time and how important is this? What would the cost be?

What about the cruise missile carriers?

General ALLEN. We estimate that the current bomber force would have a [deleted] probability of launch survival (PLS), a factor which is included in the bomber's probability of arrival at its post strike recovery base. Any new strategic penetrator would have a similar PLS. Should the Soviets move to a more threatening posture by increasing the number of [deleted] such actions would furnish strategic warning to our forces. In such a situation, we could then increase our alert posture and disperse forces, which would decrease aircrew and aircraft reaction times.

We are currently concentrating on the performance factors of the Long Range Combat Aircraft (LRCA) which affect reaction times at specific main operating

and dispersal bases. While these deliberations will assess the flight times to the Soviet target base, this factor is not considered paramount in aircraft basing considerations. Estimates of costs and the identification of major programmatic issues relative to the basing for the LCRA are also currently under consideration.

In-land basing has been selected for our B-52 cruise missile carriers to increase their survivability against SLBM threats. We recently announced an exchange of inland based B-52Ds for coastal based B-52G cruise missile carriers. Additionally, we are providing pre-launch survivability improvements at Griffiss AFB to decrease aircrew and aircraft reaction times to an SLBM threat.

MARITIME ROLE—BOMBER

Senator NUNN. What do you see as the contribution of a strategic bomber in a conventional maritime role, such as sea-control and how would the B-1 and FB-111 relate to these missions?

General ALLEN. The Long Range Combat Aircraft's range, payload, and advanced avionics will substantially enhance collateral support for the US Navy in sea surveillance, aerial minelaying, and surface attack. The B-1 and the FB-111B/C would have greater and more flexible capabilities than the B-52 due to improved offensive and defensive avionics systems. The far greater range and payload of the B-1 provide it with distinct advantages over the FB-111B/C in this mission area.

BOMBER IMPROVEMENTS ENHANCE UTILITY

Senator NUNN. Do you think there are any improvements to the B-52s or the follow-on bomber (B-1, FB-111) that could enhance the utility of the bomber in maritime missions?

General ALLEN. Yes, there are. Bomber contributions to maritime missions could be significantly enhanced by equipping them with specialized standoff weapons and linking them with the Navy's over-the-horizon target designation system.

PLANS FOR MRASM

Senator NUNN. What are the current plans for the Medium Range Air-to-Surface Missile (MRASM) in terms of giving it an anti-ship capability? Are there any problems with the Navy in this respect?

General ALLEN. On February 2, 1981, the Office of Secretary of Defense directed the Air Force to assume management of the AGM-109H (MRASM) program including its related submunitions and guidance development. The Air Force is evaluating this program in the context of a comprehensive review of our ability to fulfill the critical mission of attacking enemy airfields. This evaluation will examine various combinations of alternative delivery platforms, missiles and submunitions to perform these missions.

While we have no plans to use MRASM in an anti-ship role and, therefore, have not addressed this matter with the Navy, should MRASM be equipped with terminal guidance system and appropriate warhead, it could conceivably be deployed with B-52s in a sea interdiction role.

B-52 SURVIVABILITY

Senator NUNN. In the last Administration, there was a continuing discrepancy between the Strategic Air Command (SAC) and the Secretary of Defense as to the probability to penetrate of the B-52s. SAC based their appraisal on the current configuration of the B-52s and the Secretary based his on planned improvements. However, the planned improvements never seemed to receive funding. What improvements are needed or proper to improve the survivability and effectiveness of the B-52s, as both a penetrator and cruise missile carrier and how many of these programs are funded?

General ALLEN. The needed improvements for the B-52 penetration mission are: [Deleted] and correction of reliability/maintainability problems. With the exception of reliability and maintainability updates being pursued, none of the other modification programs are funded in the current budget request.

Improvements needed for the cruise missile carrier mission are: updates to offensive avionics systems and integration of cruise missiles; updates to defensive avionics systems to counter en route defenses from takeoff to weapon release; and correction of reliability/maintainability problems. The offensive avionics

of all B-52s are being updated. The ALCM is being integrated on the B-52G and we are maintaining the option to integrate cruise missiles on the B-52H. We are also funding the essential reliability/maintainability updates to provide an effective cruise missile launch platform. The B-52 defensive avionics updates are not fully funded. We are working with Congress to mitigate restrictions in the fiscal year 1981 authorization and appropriation committee reports regarding ECM improvements because [deleted].

COSTS/ADVANCED TECHNOLOGY BOMBER

Senator NUNN. General Ellis testified recently that he was concerned that the expenditure of significant sums on an interim bomber, such as the B-1, could jeopardize the advanced technology bomber program. Do you share these concerns and how can this problem be addressed?

General ALLEN. Yes, but I believe that the acquisition of a near term Long Range Combat Aircraft should not prejudice the development of an advanced technology strategic aircraft. Rather, it should allow us to pace our development efforts to reduce the technological risks and cost uncertainties inherent in any high technology program.

STRATEGIC PROGRAM COSTS

Senator NUNN. If you consider the six main elements of US strategic forces: ICBMs, SLBMs, manned bombers and their refuelers, possible ABM systems, air defense and warning, surveillance, and command and control systems, one can see major costs in all these areas. How important are cost considerations as you look at the overall picture in selecting a new bomber? What are the cost differences between the B-1 and the FB-111?

General ALLEN. Cost considerations are an important factor in selection of a new bomber. Strategic modernization, however, is the highest programmatic priority in the Air Force, and among these efforts, acquisition of a new bomber figures prominently.

We are currently negotiating with both Rockwell International and General Dynamics on costs for a B-1 variant and the FB-111B/C. While our present cost estimates indicate that the FB-111B/C would have a substantially lower cost per aircraft than the B-1 variant, the latter is a far more capable airplane. In addition, there would be significant cost incurred to replace the F-111Ds that would be withdrawn from the Tactical Air Force in the FB-111B/C proposal.

FLEXIBILITY TO CHANGING THREATS

Senator NUNN. We all know that we have consistently underestimated the Soviets in terms of new capability and new systems. What flexibility, if any, would a near-term bomber in terms of the B-1, provide if we suddenly discover another significant miscalculation of the Soviet threat—provide this separately for the B-1 and FB-111.

General ALLEN. We have been able to respond successfully to unanticipated Soviet threats against our bomber force through a combination of new weapons, tactics, and offensive and defensive avionics updates.

Although a follow-on bomber has not yet been selected, we are confident that the candidate aircraft will be effective against postulated and expanded Soviet air defense capabilities. I believe that both the B-1 and the FB-111B/C will be able to penetrate sophisticated Soviet air defenses well into the 1990s. Both would provide potential for responsive adaptation if confronted with greater-than-anticipated Soviet air defense capabilities. The B-1 however, with its longer range greater capacity for ECM modifications and larger payload, would be more adaptable to expanded threats than would the FB-111B/C.

BOMBER WEAPONS

Senator NUNN. In addition to consideration of an airframe, what new weapons for a manned strategic bomber are under consideration?

General ALLEN. In the strategic SIOP role, high yield gravity weapons and short and long range standoff air-to-ground missiles will continue to provide the best mix to strike all target classes. Additionally, depolyment of a standoff terminally guided weapon would enhance the capability to strike imprecisely located or mobile targets in either a strategic nuclear or conventional role.

NEW BOMBER—PENETRATION

Senator NUNN. What would the role and mission of the near-term bomber (B-1, FB-111) be once their utility as a penetrator was significantly degraded and when would this occur?

General ALLEN. Our analysis indicates that either near term candidate would have a high probability of successfully penetrating Soviet defenses into the 1990s. Beyond that time, we are less certain and therefore support an active development program for an advanced technology bomber.

Of the near-term candidates, the B-1 aircraft has the inherent payload capability to transition to a standoff ALCM launcher. Both the B-1 and the FB-111B/C could continue to provide theater nuclear and all-weather conventional theater capabilities.

Senator WARNER. We will adjourn.

[Whereupon, at 11:55 a.m., the subcommittee meeting adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1982

MONDAY, MARCH 30, 1981

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

CIVIL DEFENSE

The subcommittee met in open session, pursuant to call, at 2:56 p.m. in room 224, Russell Senate Office Building, Senator John Warner, Chairman, presiding.

Present: Senator Warner.

Staff present: Louise R. Hoppe, professional staff member and Brenda K. Hudson, staff assistant.

Also present: Chris Lehman, assistant to Senator Warner; Greg Pallas, assistant to Senator Exon; Bob Riebling, assistant to Senator Thurmond; and Dave Malloy, assistant to Senator Quayle.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. This afternoon the Strategic and Theater Nuclear Forces Subcommittee meets in open session to receive testimony on the fiscal year 1982 civil defense authorization request. The revised request before the committee is \$133 million or approximately 5 per cent real growth over the fiscal year 1981 level of \$118 million.

In support of the fiscal year 1981 civil defense program, a Department of Defense report transmitted to the Armed Services Committee by Secretary of Defense Harold Brown characterized the program as follows, and I quote:

The primary value of the fiscal year 1981 program lies in the experience it will provide through pilot deployment of elements of an enhanced civil defense program in and around specified risk areas. The degree of success which FEMA achieves and the concomitant movement towards the overall crisis relocation planning objectives of the agency should provide the basis for determining the pace at which the program can be accelerated in the outyears to achieve nationwide coverage.

That is really a good Pentagon paragraph. It is very substantive but it is written in the usual style.

It is the intent of today's hearing to receive testimony on the experience gained and the progress made in order to evaluate and to make recommendations to the Senate of the fiscal year 1982 civil defense program.

We have as our witnesses this afternoon Mr. Bernard T. Gallagher Acting Director of FEMA, accompanied by Mr. John McConnell Acting Associate Director for Plans and Preparedness. The Department of Defense is represented by Mr. Charles Estes, Jr., Director, Strategic Policy, Office of the Undersecretary of Defense for Policy.

Mr. Gallagher, we welcome you, and would you be kind enough to lead off.

Mr. GALLAGHER. Thank you, Mr. Chairman.

**STATEMENT OF BERNARD T. GALLAGHER, ACTING DIRECTOR
FEDERAL EMERGENCY MANAGEMENT AGENCY**

Mr. GALLAGHER. It is a pleasure to appear before you today to discuss our Nation's civil defense program.

In this introductory statement I shall touch upon this administration's policies for civil defense, last September's title V amendment of the Federal Civil Defense Act and the activities of the Federal Emergency Management Agency during the past year in a wide variety of emergency-related areas.

Senator WARNER. Mr. Gallagher, I am going to interrupt for a moment. As you know I have a background of over 5 years in the Department and therefore I want to come right to the heart of the introductory matter.

COORDINATION WITH DEPARTMENT OF DEFENSE

To what extent have the new Secretary of Defense and his subordinates been able to work with you and address President Carter's program and modify it to reflect their own proposed course of action?

Mr. GALLAGHER. This administration supports the plans that were made during the last administration, the title V to the Civil Defense Act of 1950 and the Presidential Directive 41 [P.D. 41], and our mandate.

Senator WARNER. To what extent have you personally met with the new Secretary of Defense?

Mr. GALLAGHER. Sir, I have not.

Senator WARNER. With whom have you worked in trying to structure or restructure President Carter's program to reflect President Reagan's viewpoints?

Mr. GALLAGHER. We have met with Mr. Estes. We have met with Mr. Allen.

Senator WARNER. What about within the Bureau of the Budget? Have you worked with anyone there? I guess the purpose of my questioning is to find out if we have had adequate time with this new administration within which to restructure the FEMA program with respect to the President's goals? Are you satisfied that there has been enough time and enough coordination between Management and Budget, the Pentagon, and other agencies?

Mr. GALLAGHER. I am not sure there has been enough coordination. But we have had enough time. The same people are here that were here during the last administration. I am not talking about the political appointees, but about the career staff, the ones who have been working with civil defense for many years, 20 to 25 years. I think we have had the time to look at it ourselves and see that this is the proper route to go.

Senator WARNER. Fine. You may continue then.

Mr. GALLAGHER. I am sure the subcommittee will be pleased to know that this administration has accepted and endorsed the policies and principles for U.S. civil defense as set forth in P.D. 41 of September 1978. These policies and principles will be the foundation for our civil defense efforts in the 1980's. The new administration is committed to the improvement of America's national defense posture and recognizes that civil defense is a significant element of our strategic nuclear deterrent.

Our current approach provides that the civil defense program, as an element of the United States/Soviet strategic balance, should achieve the capability for crisis relocation of the population of the United States risk areas in order to improve survival of the American people in the event of a nuclear war. This will in turn enhance deterrence and stability and reduce the possibility that this country could be coerced during a crisis. The program is also to be adaptable to help deal with natural disasters and other peacetime emergencies.

A major advance during the 96th Congress was the enactment in September 1980 of legislation amending the Federal Civil Defense Act of 1950 to add a new title V, "Improved Civil Defense Program." This puts into the statute book the same policies for U.S. civil defense that are enunciated in P.D. 41.

With the enactment of title V both the Congress and the executive branch are in accord and formally on the record concerning the goals of United States civil defense. Title V moreover states the sense of Congress that present civil defense programs should be improved.

We do not pretend that our current civil defense program is the last word. Rather we see the policies and principles outlined in P.D. 41 as the conceptual and practical first step in upgrading our civil defense programs. We have made substantial progress, but much more remains to be done.

Since our appearance before this subcommittee a year ago, FEMA has actively sought to improve its comprehensive emergency management of crises of all types. Resources developed under the civil defense program have been brought to bear in keeping with the sense of Congress expressed in the new title V that the civil defense program should be adaptable to help deal with natural disasters and other peacetime emergencies.

FEMA ACTIVITY HIGHLIGHTS

Highlights of FEMA's activities during the past year include: Assisting governments and citizens suffering losses from Mount St. Helens eruption; managing the program to develop emergency plans for some 500 local jurisdictions near 88 nuclear power facilities pursuant to Presidential direction of December 7, 1979. As of the end of December 1980, some 300 State and local plans had been started, 75 were completed and 3 State plans with associated local plans had been formally approved.

Other highlights include: Working with State and local civil preparedness authorities in California to coordinate planning and preparedness for a major earthquake—the odds for such a quake sometime in the next three decades are estimated by scientists at higher than 50

percent—and conducting a major 13-day emergency exercise, Rex 80 Bravo, involving 26 Federal departments and agencies designed to test and evaluate plans for a major mobilization. This exercise was conducted in parallel with a JCS exercise, Proud Spirit.

I have touched upon these activities of the past year by way of background to give you a feeling for the broad range of FEMA's emergency-related responsibilities. These embrace the full spectrum of mitigation, preparedness, response, and recovery.

I would like to stress that FEMA's full-spectrum approach includes preparedness for both peacetime and attack-caused disasters. At the local level there is but one set of assets and resources for disaster response: one chief executive, one police force, one fire department, one group of physicians, hospitals, news media, and construction contractors. The resources which respond to a tornado or an earthquake are the same as those which would respond in an attack emergency.

It follows that organization, planning, and training for emergencies is to a large degree one and indivisible. Thus FEMA's experience derived from the civil defense program in such areas as evacuation planning and developing systems for direction and control and for warning has been of unique value in developing plans and preparedness for possible nuclear power facility accidents. At the same time preparing to respond to such possible accidents has enhanced our ability to respond to attack emergencies.

I know that this subcommittee wishes to consider in detail those FEMA activities authorized under the Federal Civil Defense Act of 1950 relating primarily to protection of our population in the event of an acute international crisis or nuclear war.

John McConnell, here on my left, will now outline for you our request for authorization and appropriation for FEMA's fiscal year 1982 civil defense program. John is Acting Associate Director for Plans and Preparedness and he has 25 years of experience in the U.S. civil defense program, including 5 years at the State level. John will be followed by Mr. Charles Estes, on my right, Director of Strategic Policy, Office of the Under Secretary of Defense for Policy. Mr. Estes' appearance before your subcommittee is one indication of the close working relationships we have with the Department of Defense regarding FEMA's civil defense policies and programs.

John?

Mr. McCONNELL. Mr. Chairman, in deference to both the situation today and for the sake of time, I would like to present a prepared statement for the record and make a brief summary of the high points of that statement.

Senator WARNER. That is appreciated. Your statement in its entirety will be entered in the record.

[The prepared statement of John McConnell follows:]

PREPARED STATEMENT BY JOHN W. McCONNELL, ACTING ASSOCIATE DIRECTOR FOR PLANS AND PREPAREDNESS, FEDERAL EMERGENCY MANAGEMENT AGENCY

Mr. Chairman: I would like to address FEMA's fiscal year 1982 civil defense programs, which are the concern of this Subcommittee in these authorization hearings.

The Reagan budget requests an authorization of \$132.8 million for FEMA's civil defense activities in fiscal year 1982. This is an increase of some 11 percent over the \$120 million appropriated for fiscal year 1981.

This allows us to continue the forward movement and momentum begun in fiscal year 1981. Moreover, we propose to apply the fiscal year 1982 funds, if they are appropriated, so as to generate the maximum improvement in life-saving capability.

The general thrust of the program will continue as it is in fiscal year 1981. Thus, we propose to press forward with Crisis Relocation Planning and with the further development of the systems and capabilities that are essential to realize the full lifesaving potential of crisis relocation and of attack and postattack survival operations.

We also propose, in fiscal year 1982, to provide significant additional resources to improve emergency organizations and capabilities at the local and State levels—for if our people are to be protected, this must be done where they live, in local jurisdictions throughout the country. And our States and their political subdivisions are, pursuant to Section 2 of the Federal Civil Defense Act, jointly responsible with the Federal Government to develop civil defense protection. We feel that FEMA must support its side of this partnership if the States and localities are to support theirs.

In principle, there are two ways to protect people from the effects of large-scale nuclear attack. The first is to protect people in-place, at or near their homes and places of work. To obtain high survival rates, however, would require high-performance blast shelters in our cities, plus warning and other essential operational systems, and fallout shelters in our smaller-town and rural areas.

Such a civil defense system could result in survival of some 90 percent of the U.S. population in a large-scale attack on both military and urban/industrial targets, even with only short warning. The cost, however, would be great, on the order of \$70 billion.

Sheltering people in-place, in best-available protection in existing buildings, can save some tens of millions of lives as compared with having no civil defense. However, total survival would be less than half of our population.

The second basic way to protect people is to relocate (or evacuate) them from our larger cities and other potential risk areas over a period of several days during an acute crisis, and to develop fallout protection for the evacuees in surrounding host areas. When one considers that nearly two-thirds of our population live in potential risk areas, and that these cover only a few percent of the land area of the United States, it is clear that reasonably effective crisis relocation has great lifesaving potential.

Computer analyses have confirmed the obvious. Expected survival in large-scale attacks approximates 80 percent of the U.S. population, assuming good (but not perfect) evacuation of U.S. risk areas prior to attack.

There are obviously more uncertainties associated with crisis relocation than with a blast shelter system. Nevertheless, we believe, based upon extensive research and on experience with many peacetime disasters requiring evacuation, that crisis relocation is a feasible, moderate-cost option with potential for survival relatively near that which a \$70 billion blast shelter program would provide.

Traffic analyses suggest that our extensive transportation resources make crisis relocation a practicable option. At the end of the first day of movement, up to 60 to 70 percent of the 145 million people in U.S. risk areas could be evacuated to surrounding host areas; some 80 to 90 percent by the end of the second day; and about 95 percent by the end of the third day.

One cannot, of course, have complete certainty that the time required for crisis relocation would be available, and that is why the civil defense program must provide capabilities for protection the population in-place. However, it is far more likely that an attack would follow a period of acute international crisis than that it would occur as a "bolt from the blue."

A basis for this judgment is provided in the July 1978 report on Soviet civil defense, published by the Director of Central Intelligence. This states that "The critical decision to be made by the Soviet leaders in terms of sparing the population would be whether or not to evacuate cities" and it points out that evacuation of cities in the USSR could reduce casualties by some 100 million. The report also estimated that "a week or so" could be required to evacuate Soviet urban areas and to develop fallout protection for the evacuees.

Thus, should the Soviets start evacuating their cities this could provide time for the U.S. to implement its own relocation plans, provided that the necessary plans and operational capabilities had been developed.

We are therefore satisfied that it is essential to develop a capability for the crisis relocation option—which requires both plans and the necessary operational

systems—as rapidly as available resources permit. Developing such capabilities is indeed enjoined both by Presidential Directive 41 and by the September 1980 amendments to the Federal Civil Defense Act.

A balanced civil defense system stressing crisis relocation is cost-effective. It can contribute to the deterrence afforded by our strategic nuclear retaliatory forces, thus helping to reduce the probability of nuclear war. It can reduce the possibility of Soviet coercion during a period of crisis. And it can add tens of millions of survivors, should deterrence fail and a nuclear exchange occur.

Let me now outline our proposals for fiscal year 1982. The fiscal year 1981 program, which provided for the first real growth in over a decade, emphasized improving readiness in so-called "counter-force" areas, those jurisdictions associated with our strategic nuclear offensive forces (ICBM complexes, SAC bases, and SSBN ports). Crisis Relocation Planning was to be accelerated for such areas, and certain operational systems were to be deployed in the counter-force States and areas on a demonstration basis. These deployments were to provide a base of experience for later nationwide deployment of an improved program.

We received our fiscal year 1981 appropriation in December 1980, and we are now in the process of deploying the fiscal year 1981 program, for the most part through the States. Thus we are working with the States containing counter-force military installations to add about 60 additional crisis relocation planners, and one technically qualified Radiological Defense Officer (RDO) per State. The States RDO's will develop plans, instrumentation, and exercises and training comprising an operational system to minimize the effects of radiation hazards in the event of nuclear attack. The planners and the RDO's will be hired under State merit systems, will be trained, and then begin substantive work.

In fiscal year 1982, we propose to extend the fiscal year 1981 initiatives. We expect that by end-fiscal year 1982, initial Crisis Relocation Plans should be nearly completed for risk and host areas near counterforce military installations. On a nationwide basis, initial Crisis Relocation Plans should be about 34 percent complete for all U.S. risk and host areas, as contrasted with an estimated 24 percent as of end-fiscal year 1981. We propose, in fiscal year 1982, to start on planning for our larger risk areas, because over half the U.S. risk population lives in some 37 cities of one million or more.

It will take until roughly the end of the decade to complete initial relocation plans for all of the 3,300 risk and host jurisdictions which require them. We therefore embarked, in June 1980, on an effort to develop "mini" Crisis Relocation Plans.

Our intent is to have at least rudimentary plans developed in the near term, pending completion in the longer term of more comprehensive and detailed plans by the 205 professional planners we are supporting at the State level. The "mini" plans will cover the rudiments only of crisis relocation—automobile movement from cities, and minimal arrangements for the reception and care of evacuees in host areas. However, they will provide some initial relocation capability, as well as a point of departure for more detailed, higher-confidence plans to be developed later.

The "mini" plans would also provide a framework or starting point for local efforts to add details should an escalating crisis occur. Experience at Three Mile Island suggests that this starting point could be of value. When the TMI emergency occurred, local plans existed for evacuating people within five miles of the plant. Evacuation within a 20-mile radius was then recommended. While the earlier plans had to be completely revised, to cover an area 16 times larger, they nonetheless had value as a point of departure for preparing plans for the much larger potential evacuation area, and at least rudimentary planning was in fact completed by the counties affected in about three days of intensive work.

The "mini" relocation planning effort is in keeping with our intent to develop maximum lifesaving capabilities with the resources available. In fiscal year 1981, we are relying primarily, for development of the plans, on local civil defense staffs supported with Federal matching funds. Acceptance of the program has, on the whole, been good. As of December 31, 1980—6 months after the starting date—planning had been started in about 1,170 risk and host jurisdictions, and some 339 plans had already been completed.

By the end of fiscal year 1981, we project that about 1,200 "mini" plans will be completed. During fiscal year 1982, we hope to have plans completed for most jurisdictions not having full-scale relocation plans, including many jurisdictions that do not have staffs supported with matching funds.

Recently, we took another action in keeping with the concept of developing interim capabilities pending completion of more effective and expensive systems. We know from past experience that in times of perceived tension, such as the Cuban missile crisis and the more recent invasion of Afghanistan, the public become concerned about getting survival information, and demand for civil defense literature escalates rapidly. Stocks of booklets describing the effects of nuclear weapons, and shelter and other means of protection, are quickly depleted.

Accordingly, in January 1981 we distributed to State and local civil defense offices a set of 15 newspaper columns, covering attack effects and means of protection. These columns are in camera-ready form, and could be published in newspapers quickly at a time when stocks of booklets would be inadequate to meet the public demand.

These newspaper materials would supplement a 25-minute television film, "Protection in the Nuclear Age," copies of which were prepositioned in 1978 in the States, our Regional offices, and the Army's film libraries. Also, we propose in FY 1982 to begin to deploy materials which would provide a basis for crisis training of citizens throughout the country. This system would supplement and expand upon the initial citizen-information capability provided by the television film and the 15 newspaper columns.

I would like to emphasize that Crisis Relocation Plans alone cannot be equated to an effective civil defense program. Indeed, our analyses indicate that completing "paper plans only" for crisis relocation might result in survival of only some 46 percent of the U.S. population, an increase of an estimated 6 or 7 percent over the survival that current civil defense capabilities could produce.

Achieving the full lifesaving potential of crisis relocation requires a variety of emergency systems and capabilities comprising a balanced civil defense system. The elements of such a system include trained staffs, facilities, communications, procedures and processes for direction and control by key local and State officials, and related capabilities for warning, radiological detection and assessment, emergency public information and other support activities.

During fiscal year 1982 we propose to continue developing these capabilities, again aiming at maximum improvement within the limits of resources available.

Emergency Operating Centers (EOC's) are essential for coordination and direction of local and State operations during the crisis, attack and postattack periods. For fiscal year 1981, we had requested funding to develop EOC's on a fully-funded basis, by a combination of upgrading existing structures or in some cases incorporating an EOC in new public buildings being constructed in counterforce States and areas.

The September 1980 amendments to the Federal Civil Defense Act provided, however, that EOC's should be developed on a matching-fund basis, rather than being fully funded. We are accordingly developing criteria and an approach modified from that of prior years, which will provide a greater increase in direction and control capabilities per dollar invested than was realized under the previous matching-fund program.

The overall thrust of our new approach will be to improve operational capabilities for direction and control in both attack and peacetime emergencies. These capabilities include EOC facilities and those communications essential to tie together for emergency use the extensive communications that already exist in most jurisdictions. In addition, EOC communications must be protected against electromagnetic pulse (EMP). Direction and control operational capabilities also include "software" components which are fully as important as "hardware," namely, the development of plans and procedures for EOC staffs, and their training in exercises based on simulated emergencies.

Matching funds for EOC facilities, or for communications equipment or emergency power generators, will be provided only where other operational capabilities—EOC plans and staff training—are brought to an acceptable level. Both hardware and software elements must be developed concurrently.

Matching funds will be provided on a priority basis, keyed to cost-effectiveness. Thus, we will in general provide assistance where existing facilities can be brought up to operationally ready status by low-cost modification to obtain adequate fallout protection, or merely by adding, for example, an emergency-power generator, or certain communications not required for normal, day-to-day operations. Also, by permitting applicants to apply "in kind" matching for existing space, we are encouraging modification of existing facilities, and making the program more feasible for the majority of lower-population host-area jurisdictions.

Where matching funds are needed to include an EOC in new construction, such as a new court house or city hall, our policies and procedures permit matching only the minimum costs associated with such new construction, by addressing such cost as if we were modifying the building for an EOC subsequent to completion.

We will also provide matching funds for communications for mobile command centers for risk-area jurisdictions, to assure survivable direction and control, and to complement host area direction and control capabilities.

An additional factor of great importance in establishing EOC priorities will be the number of people served. Thus, where other costs and factors are roughly equal, an EOC that would serve say 30,000 people would be given priority over an EOC serving 15,000 people.

We expect that the approaches I have just outlined will result in maximum return on the EOC matching funds provided. (The fiscal year 1981 appropriation provides some \$5.5 million for EOC matching funds, and we have requested some \$6.5 million for these matching funds for fiscal year 1982.) It is our intention and commitment to field a program that will be more effective than was the case in fiscal year 1978 and before.

In fiscal year 1981 we are also resuming the provision of matching funds for Supporting Materials, an account which in fiscal year 1978 and prior years was focused on equipment items and components of rescue and of local and State warning and communications systems. As a result there was little evidence of increased systems capability in relation to dollars spent. With the resumption of this program, we are reorienting it to stress the completion and upgrading of local and State total systems capabilities rather than providing matching funds for the purchase (or replacement) of individual pieces of equipment. We have requested some \$4.5 million for such matching funds in fiscal year 1982, and propose to emphasize development of State and area-wide communications and warning systems.

Because our people must be protected where they live and work, in localities throughout the United States, supporting viable local and State civil defense agencies is of central importance to providing effective protection. Local communities are the first line of civil defense.

We rely on the local and State professional staffs to develop effective protective systems, making use of the professional planning assistance, Federal matching funds, and other support we provide through our Regional offices to and through the States. As I noted earlier, we are relying primarily on these State and local staffs to develop "mini" Crisis Relocation Plans.

We have provided matching-fund support for State and local civil defense staffs since fiscal year 1961, under authority contained in Section 205 of the Federal Civil Defense Act. This assistance was provided to support the personnel and administrative expenses of the State and local personnel, and the program was thus termed "P&A" assistance. We have changed this designation to "Emergency Management Assistance" (EMA), to connote the broadened range of responsibilities encompassed under FEMA's programs for Comprehensive Emergency Management.

All States and some 2,530 local jurisdictions participate in the EMA matching-funds program. The importance of this support is shown by the fact that some 80 percent of our population live in the 2,530 participating localities.

Our support for State and local civil defense agencies has eroded, however, due to inflation—by some 30 percent over the past 4 years. State and local civil defense directors will be glad to hear that we are requesting \$43.9 million for EMA (formerly P&A) matching funds in fiscal year 1982, to support an enhanced civil defense effort. This is an increase of some 18 percent over the fiscal year 1981 level, or a real increase of perhaps 10 percent when inflation is considered. This will compensate in part for the erosion of the past several years.

We are requesting that the limitation on expenditures for EMA matching funds, in the last proviso of Section 408 of the Federal Civil Defense Act, be raised from \$40 million to \$47 million. The appropriations act for fiscal year 1981 (Public Law 96-526) brought together both the EMA matching funds and those for maintenance and services, with both to be handled under the criteria specified in Section 205 of the Federal Civil Defense Act.

We are in accord with this approach. In fiscal year 1981, the two accounts totalled some \$39 million, and no adjustment was needed in the "ceiling" (or limitation on expenditures). For fiscal year 1982, however, we are requesting a total of some \$46.2 million for these accounts (some \$43.9 million for EMA and

\$2.3 million for maintenance and services), and are accordingly asking that the ceiling be raised to \$47 million.

In the area of radiological defense, we intend to develop capabilities needed as an integral part of a civil defense program stressing crisis relocation. In conjunction with the military, we are continuing development of low-cost instrumentation. The results of work to date will allow us to begin developing a mobilization base for producing low-cost dosimeters, which would be essential to minimize deaths and illness caused by fallout radiation.

In fiscal year 1982 we will also pursue initiatives begun in fiscal year 1981, in such areas as protection of commercial broadcast stations, shelter stocks, shelter management training, provision of simulated-emergency exercises for key local and State officials, and research and development.

In summary, we propose in fiscal year 1982 to make the maximum progress possible, with the \$132.8 million requested, in improving America's civil defense posture. We shall nearly complete initial Crisis Relocation Plans for counterforce areas, and develop plans which will result in a cumulative total of plans for some 34 percent of the 3,300 jurisdictions which need them nationwide. In fiscal year 1982, our emphasis in crisis relocation planning will be extended from the counterforce areas to the larger cities, in which live over half the U.S. risk population.

We also propose to increase the effectiveness of our matching-fund support for State and local civil defense agencies and programs. This includes funds for their staff and operating expenses, as well as for State and local Emergency Operating Centers and warning and communications systems. New and more effective management approaches should assure maximum return on the matching funds provided to State and local governments.

I believe that the fiscal year 1982 program reflects an effective allocation of the \$132.8 million we have requested. It will enhance readiness for international crisis or nuclear attack, at the same time improving capabilities to deal with peacetime emergencies and disasters—as enjoined both by PD-41 and the September 1980 legislation that added a new Title V to the Federal Civil Defense Act.

This concludes my prepared statement. I would be happy to discuss in more detail the issues of interest to the Subcommittee.

STATEMENT OF JOHN W. McCONNELL, ACTING ASSOCIATE DIRECTOR FOR PLANS AND PREPAREDNESS, FEDERAL EMERGENCY MANAGEMENT AGENCY

Mr. McCONNELL. Mr. Chairman, I would like to clarify slightly what Mr. Gallagher said with reference to the position of this administration with regard to the civil defense program. We have received an acknowledgment from the administration endorsing and accepting the policies defined in the Presidential decision 41 which has been reflected in law as part of a new title V of the Federal Civil Defense Act.

The program itself has not yet been evaluated as to its future, and I think that is what Mr. Gallagher intended to convey. We are in staff discussions with the Defense Department and with the National Security Council on these issues and we are awaiting the assignment of a permanent director of FEMA, which will probably bring to a focus the administration's position with regard to the future of the civil defense program.

1982 BUDGET REQUEST

This budget request for fiscal year 1982 includes \$132.8 million which is the Reagan revision reflecting only some personnel and travel reductions, and not making any program reductions from the request developed previously by the Carter administration. The

\$132.8 million compares to \$120 million for civil defense appropriated in fiscal year 1981.

The general thrust of the program in 1982 will be to continue those initiatives which were outlined in the fiscal year 1981 program. These focus on the counterforce areas, including demonstration projects, that could provide a basis for beginning a possibly larger program, which could be deployed nationwide in a shorter period of time than would be possible under the present budget level. However we are concentrating upon cost of effectiveness, and the highest return in lives saved for the dollars we have requested.

So we are concentrating on planning, realizing that paper plans alone provide only a limited life-saving capability. The bulk of the life-saving capability would come from operational systems to make those plans work, and training people to react in the fashion that the plans call for. These are things that have to be filled out over a period of years, through activity at the State and local levels.

Obviously there are two ways to protect people against the effects of a nuclear attack. One is to attempt to provide blast protection from the direct effects of the weapon should they be in the vicinity of its explosion. The other is to have them elsewhere when that explosion occurs. If we attempted to pursue the first, with a large-scale nuclear attack on this country, we could not expect to save more than about 40 percent of the population without a massive blast shelter program which would cost in the vicinity of \$70 billion.

We have determined that the more practical approach is to attempt to get people away from the risk areas through the crisis relocation or evacuation approach. This can be done at a reasonable cost in a reasonable length of time. While not providing the 90-percent probable survival that could be attained from a blast shelter program, a crisis relocation program at a very small fraction of the cost of blast shelters could result in expected survival of about 80 percent of the national population, under an all-out attack on the United States.

We capitalize on the fact that we must have a get-ready time, or as some people call it a warning time which is somewhat misleading. We consider this strategic warning brought about by activities of an international crisis nature which would give us an opportunity to evacuate people from the high risk areas in the United States. We are fairly certain that there is a high probability that this leadtime would occur because if the U.S.S.R. were the attacking force, they could expect about 100 million casualties in return if they did not evacuate their cities. They do in fact have evacuation plans. If we found out through our intelligence sources that the Soviets had activated their evacuation plans, we would have time to do the same if we had those plans in place. That is the general nature of our program.

SOVIET CIVIL DEFENSE

Senator WARNER. Do you include in your statement a comparison of the U.S. civil defense program with that of the Union of Soviet Socialist Republics?

Mr. McCONNELL. In general, Mr. Chairman, but not in specific detail.

Senator WARNER. Do you wish to supplement that information? It is a subject that is of great interest not only to the Senate but to the public as a whole, and I think it is an obligation of this subcommittee and those of us providing oversight to make certain that it is updated each year to the extent possible within the unclassified sources of information.

Mr. McCONNELL. Yes, sir. The best document we have for that purpose is a declassified interagency security memorandum which was produced in 1978. There has not been a declassified updating of that. It has however been updated, and we will either make a classified briefing available to the committee or we will obtain an unclassified update.

Senator WARNER. I would recommend we do both. I will be glad to convene this committee in an executive session to receive a classified briefing, and I strongly urge you to supplement the record with respect to all information giving the comparison.

[FEMA will arrange for a classified briefing at the convenience of the subcommittee.]

Mr. McCONNELL. I will be glad to do that, sir.

I would like to emphasize also as I do in my statement that the heart of the preparedness program in the United States is the activity which must take place at the State and local levels, the local level in particular, where the people are. All of our programs capitalize on the benefits that accrue from having efforts that are directed toward national security and which are available for dual use for any kind of an emergency of either a natural disaster or manmade type. That is the theme throughout our program.

I think with that, Mr. Chairman, I will close and be available for questions.

Next we will hear from Mr. Estes of the Department of Defense.

Senator WARNER. Thank you.

Mr. Estes?

Mr. ESTES. Mr. Chairman, with your permission, considering the shortness of time and your extensive background in civil defense, I will also submit my prepared statement for the record and summarize it just to speed the situation along.

[The prepared statement of Charles E. Estes, Jr., follows:]

PREPARED STATEMENT OF MR. CHARLES E. ESTES, JR., DIRECTOR, STRATEGIC POLICY, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR POLICY, DEPARTMENT OF DEFENSE

Mr. Chairman, members of the committee, I appreciate this opportunity to testify before this committee on behalf of the Federal Emergency Management Agency's proposed civil defense program for fiscal year 1982.

As you are aware, the Department of Defense and the National Security Council share responsibility for oversight of FEMA's civil defense efforts. In addition, each year the Department prepares a civil defense oversight report for the Armed Services Committees of Congress. That report assesses, among other things, the extent to which the program provided for in the FEMA proposed budget is sufficient to implement the civil defense policy guidelines prescribed by the President.

The first of these oversight reports was submitted a year ago and dealt with FEMA's Fiscal Year 1981 proposal, a proposal which, I am happy to say, the Congress saw fit to fund substantially as requested. In doing so, the Congress gave the Federal Emergency Management Agency the resources needed to take steps toward improving America's civil defense capability.

The second of the Defense Department's oversight reports was submitted last January 19th. That report covers the program that you are considering here today, a program that will build upon the Fiscal Year 1981 effort. With your permission, I will confine my remarks to a brief summary of that report's conclusions.

On the basis of our assessment of information provided by FEMA, DOD has concluded that FEMA's proposed program for fiscal year 1982 meets the requirements of national policy as defined in Presidential Directive 41 and the recently amended Civil Defense Act of 1950.

PD-41 recognizes that civil defense, as an element of the strategic balance, should assist in maintaining perceptions of that balance favorable to the United States and thus, in turn, enhance deterrence and stability. At the same time, it acknowledges continuing U.S. reliance on strategic nuclear forces as the preponderant factor in maintaining deterrence, calling for civil defense programs that will provide some increase in the number of surviving population, should deterrence fail, through achievement of a capability for crisis relocation of the urban population. Recent amendments to the Civil Defense Act of 1950 express a sense of Congress commitment to these same considerations. Together, the two statements reflect accord over national civil defense policy.

FEMA's proposed fiscal year 1982 program visibly supports all of these goals. We have every reason to believe that, if funded as requested and carried out as planned, the program will continue the movement begun last October toward acquisition of a crisis relocation capability that will measurably increase the number of survivors of a nuclear attack on the United States. Movement toward an improved civil defense capability through the measures defined in this program cannot help but improve perceptions of the strategic balance. Therefore, there can be little doubt that the program supports current policy.

I am also pleased to report that a close working relationship continues to exist between FEMA and the Department of Defense over matters related to the integration of planning for nuclear attack preparedness with other strategic planning, and that a similarly close consultative relationship exists on matters of civil defense policy and program content.

The transfer to FEMA of managerial responsibility for civil defense, with retention of oversight responsibility in the Defense Department and the NSC necessitated the creation of many new organizational interface arrangements. These arrangements have been in operation for more than a year. During that time we have learned that, for the most part, they work well. Nevertheless, we are considering ways to improve them in order to further insure that the effective link between strategic nuclear planning and nuclear attack preparedness planning is not only maintained but strengthened. FEMA and the Defense Department both recognize that only through continued close cooperation can we best support the strong commitment to acquiring the improved civil defense posture that is inherent in present policy.

In conclusion, let me once again say that the Defense Department finds the proposed fiscal year 1982 program consistent with current national civil defense policy, and that it supports this submission. We share this committee's concern for a sound civil defense program. And we are pleased to support FEMA's efforts to attain one. Thank you.

STATEMENT OF CHARLES E. ESTES, JR., DIRECTOR, STRATEGIC POLICY, OFFICE OF THE UNDERSECRETARY OF DEFENSE FOR POLICY, U.S. DEPARTMENT OF DEFENSE

Mr. ESTES. As you are aware, the Department of Defense and the National Security Council share a joint responsibility for oversight of FEMA's civil defense efforts. On the basis of our assessment of information provided by FEMA, the Department of Defense has concluded that FEMA's proposed program for fiscal year 1982 meets the requirements of national policy as defined in Presidential Directive 41 and the recently amended Civil Defense Act of 1950.

We have every reason to believe that if funded as requested and carried out as planned, the program will continue the movement begun

last October toward acquisition of a crisis relocation capability that will measurably increase the number of survivors during a nuclear attack on the United States.

I am also pleased to report that a close working relationship continues to exist between FEMA and the Department of Defense over matters related to the integration of planning for nuclear attack preparedness with other strategic planning, and that a similarly close consultative relationship exists on matters of civil defense policy and program content.

The Department of Defense supports this submission. We share this committee's concern with a sound, well structured, well managed civil defense program; and we are pleased to support FEMA's efforts to attain one.

That concludes my remarks.

Senator WARNER. Thank you very much.

I will go into some questions at this juncture, gentlemen, but I will submit others for the record.

I will address my questions to Mr. Gallagher and Mr. Estes. However if you would like to join in, Mr. McConnell, please do so. There is nothing like corporate memory. To my recollection you have devoted 25 years of your career to this subject?

Mr. McCONNELL. Yes, sir.

Senator WARNER. That is a notable contribution. You are to be commended.

Mr. McCONNELL. I am most proud of my service at the State level sir.

CIVIL DEFENSE GOALS AND PROGRESS

Senator WARNER. What are the overall goals and priorities of the civil defense program? How do you measure the progress toward attaining these goals? What progress will be made in attaining these goals as a result of a fiscal year 1982 budget of the magnitude requested today?

Mr. GALLAGHER. Mr. Chairman, with your permission I would like to ask John McConnell to answer those questions.

Senator WARNER. Yes, indeed.

Mr. McCONNELL. Mr. Chairman, if I understood the question right, I hope that the words came through properly from both Mr. Estes and myself that P.D. 41 does have the essence of reasonable and clear policies with regard to the objectives of the civil defense program in the United States.

However it should be pointed out that P.D. 41 does not have a timeframe through which these objectives are met. To continue the movement that has been started in the budget level, which was an increase over the previous year in 1981 and hopefully again in 1982, will not accomplish the ultimate objectives of P.D. 41 in a reasonable length of time. We will essentially have crisis relocation plans, that is paper plans only, in a decade at this rate. And in my opinion those plans that were prepared in the early part of the 10-year period will be relatively ineffective at the end of the 10-year period. Therefore we are in an inevitable cycle of lack of completion, so to speak.

At the same time, as I mentioned in my statement, these plans must be supported by effective systems that can operate—

[Notification was received at this time that President Reagan had been injured in the March 30, 1981, assassination attempt.]

Senator WARNER. Will you excuse me, please?

Mr. Gallagher, I think that you might wish to absent yourself and return to your office now. There could well be responsibilities for you and you likewise, Mr. McConnell.

We will submit the questions for the record at this time.

[Questions submitted by Senator John W. Warner to be answered for the record follow:]

CIVIL DEFENSE GOALS AND PRIORITIES

Senator WARNER. Mr. Gallagher and Mr. Estes, in order for this committee to fulfill its oversight responsibility for the civil defense program I feel that we must work together to find a meaningful way to measure the progress of the civil defense program. What are the overall goals and priorities of the civil defense program?

Mr. GALLAGHER. The overall goals and priorities of the program derive from the policies specified in Presidential Directive 41 of September 1978 (which has been accepted and endorsed by the Reagan administration) and also in the September 1980 amendments of the Federal Civil Defense Act. These added a new Title V, "Improved Civil Defense Program" (Public Law 96-342, 94 Stat. 1088-1089), to the Act.

The PD-41 and Title V policies establish the goal of attaining a capability for crisis relocation of the population of U.S. metropolitan and other risk areas, to improve survival in the event of nuclear attack, in turn enhancing deterrence and stability and reducing the probability of Soviet crisis coercion. The program is also to be adaptable to help deal with peacetime emergencies and disasters.

The priorities which are necessarily implied by this goal include developing a balanced civil defense system, providing for crisis relocation plans plus the operational systems and capabilities required to realize the full lifesaving potential of crisis relocation. These generally include facilities, personnel and procedures for direction and control of emergency operations (including exercising for key local and State officials), warning the population, measurement and analysis of radiological fallout hazards, and providing emergency public information.

Mr. ESTES. The overall goals and priorities of the civil defense program are defined in Presidential Directive (PD) 41. We have been advised that the new administration has temporarily reaffirmed this directive.

PD-41 directs that the United States civil defense program seek to:

Enhance deterrence and stability in conjunction with our strategic offensive and other strategic defensive forces. Civil Defense, as an element of the strategic balance, should assist in maintaining perceptions of that balance favorable to the U.S.

Reduce the possibility that the U.S. could be coerced in time of crisis.

Provide some increase in the number of surviving population and for greater continuity of government, should deterrence and escalation control fail, in order to provide an improved basis for dealing with the crisis and carrying out eventual national recovery.

It also notes that this policy does not suggest any change in continuing U.S. reliance on strategic offensive nuclear forces as the preponderant factor in maintaining deterrence, that U.S. civil defense programs will take advantage of the mobility of the population stemming from wide ownership of private automobiles, the extensive highway systems, and the large number of non-urban potential housing facilities to achieve crisis relocation of the urban population, and that civil defense programs should also help deal with natural disasters and other national emergencies.

CIVIL DEFENSE PROGRESS

Senator WARNER. How do you measure progress toward attaining these goals?

Mr. GALLAGHER. Progress is measured in two ways. First, progress is measured in each of the several program areas, e.g., numbers of crisis relocation plans developed, numbers of Radiological Defense Officers trained, and so on, as compared to total requirements. Thus, as of end-Fiscal Year 1980, some 519 crisis

relocation plans had been completed vs. some 3,300 required, giving a cumulative status of 16 percent completion.

FEMA also has a detailed nuclear casualty assessment system and model which produces estimates of expected survival in a large-scale attack. (This system was described in a paper reprinted in last year's hearings. See U.S. Senate, Committee on Armed Services, Hearings, Department of Defense Authorization for Appropriations for Fiscal Year 1981, 96th Cong., 2d Sess., Part 6 at 3605-3611.) Expected survival in a large-scale, mid-1980's attack would be about 40 percent, given current CD capabilities, whereas survival with a balanced civil defense (CD) system based on crisis relocation would be on the order of 80 percent, assuming that the relocation is executed reasonably effectively. Such assessments provide the most informative and useful measurement of overall status.

Mr. ESTES. Two years ago, when we began to develop a methodology for assessing FEMA's program, we believed it was necessary to find a way to measure annual progress, considering that PD-41 called for some increase in population survival and for acquisition of a crisis relocation capability to bring this increase about.

We concluded that FEMA essentially had developed a program that would provide a supporting infrastructure for a crisis relocation capability. It was also determined that this supporting infrastructure is made up of tangible things, such as numbers of shelter surveys, relocation plans, shelter stocks, and the communications and emergency operating facilities, etc., needed to move the population from the defined risk areas to the defined host areas. If you know where the risk areas are, how many people are in them, where you want to move them, and what the local conditions that affect movement are, you should be able to estimate the numbers of these things that will be required. Therefore, the total of these tangible items could be calculated to provide a basis for estimating progress toward acquiring the quantities of each of these infrastructure elements—or program elements, as FEMA calls them—needed to achieve a crisis relocation capability, both in the specified areas and nationwide.

We concluded that if we know the total requirements for each program element, the numbers currently available, and the increments that each year's expenditure would buy, we could measure progress provided by each fiscal year's funding. FEMA did all the counting, and provided the completion percentages. Those figures constitute the percentages contained in our report. By then comparing the percentage of completion at the end of each year's incremental effort we can get an understanding of how the program effort is progressing. Since this data is computed by FEMA, we would have to defer to them for a more detailed explanation if it is desired.

The fiscal year 1982 report was the second report in which this approach was used. Like the fiscal year 1981 report, the percentage tables show positive anticipated progress on most program elements. From this, we conclude that the fiscal year 1982 program provides movement toward acquisition of a crisis relocation capability that will increase the number of surviving population. Therefore, the program is consistent with policy as defined in PD-41.

I should point out, however, that we are dealing with forecast results that are predicated upon the assumption that requested funding levels will indeed be granted. The fiscal year 1982 report forecasts were made shortly after fiscal year 1981 funds were appropriated and fiscal 1981 began. We will not know whether the programmed goals were met (adjusted if necessary for the actual fiscal year 1981 appropriation) until next year at this time.

Senator WARNER. What progress will be made in attaining these goals as a result of the fiscal year 1982 budget?

Mr. GALLAGHER. Progress projected, assuming appropriation of the funds requested for CD in fiscal year 1982, would be approximately as set forth in the 1982 column of the table attached for the various program elements. (The data were provided to DOD in December 1980, and some minor adjustments are anticipated by reason of developments since that time, e.g., nationwide host area shelter surveys are no longer expected to be 87 percent complete by end-fiscal year 1982, due to personnel reductions directed in February 1981.)

Mr. ESTES. According to the percentage information provided by FEMA, the Department of Defense expects the fiscal year 1982 program to provide the following incremental increases in program element capability:

NET INCREASES IN CAPABILITY¹

[100 percent equals full capability, amounts in percent]

	Specified areas	Nationwide
Shelter survey: ²		
Host areas	0	+21.0
Risk areas	0	0
Nuclear civil protection planning:		
Initial CRP's	+30.0	+10.0
Initial CRP's plus CSP's	+14.0	+4.0
Initial CRP's plus CSP's plus enhanced CRP's	+2.0	+2.0
Planning for crisis shelter production	+5.0	+7.0
Shelter marking	+13.0	+6.0
Shelter stocks	+2.6	+2.0
Ventilation kits	+2.8	+2.0
Shelter management officers	+8.0	+8.0
Shelter managers	+2.0	+2.0
Warning and communications points ³	0	0
Warning and communications circuits	+2.0	+2.0
State/area emergency operating centers:		
Direction and control features	+10.0	+10.0
Facility operational features	+3.0	+3.0
Survivability features	+1.0	+1.0
Local emergency operating centers:		
Direction and control features	+10.0	+10.0
Facility operational features	+4.0	+4.0
Survivability features	+1.0	+1.0
Direction and control exercising ⁴	0	+0
Radiological defense:		
State/area officers (full time)	0	+6.0
Local officers (part time)	+12.0	+18.0
Monitors (emergency services, reporting stations)	+2.0	+2.0
Instructors (crisis monitor training)	+14.0	+14.0
Shelter instruments ³	0	0
Other instruments ³	0	0
Crisis-expectant training capability	+14.0	+14.0
Emergency public information	+58.0	+12.5
Broadcast station protection	+17.0	+1.0

¹ These percentages were calculated by subtracting the expected levels of program element completion for 1981 from the expected levels of completion for 1982.

² Effort in specified areas completed in fiscal year 1981. Nationwide risk area efforts will reach 20 percent completion in fiscal year 1981, with no gain in fiscal year 1982.

³ Fiscal year 1981 levels will be maintained.

⁴ Fiscal year 1981 levels in specified areas will be maintained.

ELEMENTS OF ENHANCED CIVIL DEFENSE

Senator WARNER. Mr. McConnell, what are the elements of an enhanced civil defense program?

Mr. McCONNELL. The elements of an enhanced program are generally as specified by Sec. 502(b) of the Federal Civil Defense Act, added by the September 1980 amendments (94 Stat. 1088-1089). These elements are also specified in more detail in the table attached (host area surveys, crisis relocation plans, Radiological Defense Officers, and so on).

Senator WARNER. What experience has been gained as a result of deployment of these elements in the counterforce areas? What are the strengths and weaknesses?

Mr. McCONNELL. The fiscal year 1981 appropriation was enacted in December 1980 and our apportionment received in January 1981. Accordingly, we are currently (early April 1981) in the process of deploying the fiscal year 1981 program. Sixty additional Nuclear Civil Protection (NCP) planners are being hired in the counterforce (CF) States under State merit systems, as are technically-qualified full-time Radiological Defense Officers (RDO's). We have executed contracts to provide crisis relocation maps and instructions in telephone directories in Plattsburgh, New York, and elsewhere, and also to develop a television tape on crisis relocation. The latter will include general information on crisis relocation, as well as specific details unique to Plattsburgh. FEMA's Training and Education office has begun development of a Shelter Manager instructor guide, as well as self-study materials suitable for use in citizen training during a crisis. The FEMA training delivery system will provide for the conduct of simulated-emergency exercises in CF States and areas.

Accordingly, no specific experience has yet been gained as the result of deployment of the elements of an enhanced program in CF areas, nor are there any indications of specific strengths and weaknesses.

We do expect to benefit by the experience, although we do not anticipate any major new lessons or indications of strengths or weaknesses to emerge from the deployment of program elements. State NCP planners have been on board and working on crisis relocation plans since 1976, and no problems are apparent in hiring and training new planners. The same is true of RDO's. No problems appear to be inherent in the process of publishing crisis relocation maps and instructions in telephone directories (which has been done for a number of years in Norway and Sweden, though not in the U.S.). Developing new Shelter Manager Officer training materials requires only updating material prepared during the 1960's to reflect a number of important new concepts developed by research since that time. Given the modest real growth provided for in the fiscal year 1981 budget, it made most sense to confine the new initiatives to a limited subset or number of areas, and the CF areas comprised a subset which was appropriate in point of number, geographical distribution, and degree of risk.

Senator WARNER. At what pace should the program proceed?

Mr. McCONNELL. The program will proceed at the pace determined by program and budget decisions. The fiscal year 1982 program as submitted (\$132.8 million) will make some progress towards achievement of a crisis relocation capability. As noted in the assessment provided to the Committee on January 19, 1981, by the Under Secretary of Defense for Policy, the fiscal year 1982 program is consistent with the PD-41 policy guidelines. At the same time, it is "... obviously limited in scale and pace ... because of limited funds and competing priorities. Were additional resources available ... increases could usefully be made to bring the program more in line with what would be required fully to meet existing guidelines" (i.e., PD-41).

TABLE 1.—PROGRAM ELEMENT STATUS

(Percent complete fiscal years)

As of end—	Specified areas			Nationwide		
	1980	1981 ¹	1982 ²	1980	1981 ¹	1982 ²
Shelter survey:						
Host areas	90	100.0	100.0	54	66.0	87.0
Risk areas	78	100.0	100.0	18	20.0	20.0
Nuclear civil protection planning:						
Initial CRP's	39	65.0	95.0	16	24.0	34.0
Above plus CSP's	30	40.0	54.0	10	14.0	18.0
Above plus enhanced CRP's	0	0	2.0	0	0	.2
Planning crisis:						
Shelter						
Production	0	1.0	6.0	0	.1	.8
Shelter marking	35	54.0	67.0	35	36.0	42.0
Shelter stocks	0	0	2.6	0	0	.2
Ventilation kits	0	0	2.8	0	0	.2
Shelter management:						
SM officer	0	0	8.0	0	0.	.8
SM's	0	.1	.3	0	.1	.3
Warning and communications:						
Warning pts	40	86.0	86.0	40	46.0	46.0
Circuits ³	18	18.0	20.0	22	22.0	24.0
Direction and control—State: Area EOC's: ⁴						
D. & C. features	60	60.0	70.0	60	60.0	70.0
Facilities operational features	87	87.0	90.0	87	87.0	90.0
Survivability features	15	15.0	16.0	15	15.0	16.0
Local EOC's (Host area): ⁴						
D. & C. features	15	15.0	25.0	15	15.0	25.0
Facilities operational features	31	31.0	35.0	31	31.0	35.0
Survivability features	33	33.9	35.0	33	33.0	35.0
D. & C. exercising	0	38.0	38.0	0	7.0	7.0
Radiological defense:						
State/State area RDO's (full time)	3	35.0	35.0	5.0	12.0	18.0
Local RDO's (part time)	24	36.0	48.0	33.0	42.0	60.0
RM's (emergency services, reporting stations)	17	19.0	21.0	27.0	28.0	30.0
Instructors to train RM's in crisis	38	52.0	66.0	57.0	71.0	85.0
Shelter instruments	2	2.0	2.0	3.0	3.0	3.0
Other instruments	100	100.0	100.0	100.0	100.0	100.0
Emergency public info/citizen training:						
Crisis training capability	0	0	14.0	0	0	14.0
EPI mt 1	0	4.0	62.0	0	.5	13.0
Broadcast station protection	16	26.0	43.0	23.0	23.0	24.0

¹ Fiscal year 1981 status represents best current estimate (Jan. 12, 1981). Estimates are subject to amendment based on apportionment of fiscal year 1981 funds and possible fiscal year 1981 reprogramming. (Amending fiscal year 1981 estimates would also affect fiscal year 1982 estimated status.)

² Fiscal year estimates based on assumption that appropriation will be for \$134,000,000.

³ Term "circuits" refers to areawide communications and warning systems. Fiscal year 1981 program implementation will be limited to demonstration projects to establish a basis for fiscal year 1982 performance criteria. Projects approved in fiscal year 1981 will not generate results until fiscal year 1982 and these are represented by the percentages shown in fiscal year 1982 columns.

⁴ FEMA's fiscal year 1981 budget requested full Federal funding for EOC development including communications. The Defense Authorization Act, 1981, Public Law 96-342, requires this program be administered on a matching funds basis. As a result, FEMA is in the process of restructuring and refining its analysis of EOC capabilities. The estimates shown are predicated upon "first cut" analyses of base data and upon the perception that fiscal year 1981 funding will not materially impact upon capabilities until fiscal year 1982. The "D. & C. Features" and "Facility Operational Features" include planning and staff training as well as some communication categories, all of which contribute to a preattack capability to execute crisis relocation plans. "Survivability Features" are the higher cost items of attack-effects protection that assure capabilities to sustain direction and control capabilities through and beyond the attack phase.

Senator WARNER. Mr. McConnell, this committee requires an annual report from the Secretary of Defense evaluating the civil defense portion of the FEMA budget. Part of this report contains a table (attached) providing the status of various program elements of the civil defense program. This information is provided to the Department of Defense by FEMA. It was the intent of the Department of Defense that this approach would comply with the committee's request and provide a necessary audit trail on the expenditure of resources.

Could you describe how this data is compiled—is the data presented consistently year after year, i.e., do you compare the same data for identical program elements each year?

Mr. McCONNELL. In general, we have compared the same data for identical program elements for each of the two years we have provided information to DOD (i.e., for the fiscal year 1981 and 1982 programs).

In one area, the data was not the same. This related to Emergency Operating Centers, where for fiscal year 1981 we had requested funds to develop State and local EOC's on a fully Federally-funded basis. Accordingly, for fiscal year 1981 we estimated the number of EOC's that could be developed during fiscal years 1981 and 1982 at the level of funding requested, and the resulting percentage progress towards meeting requirements.

The September 1980 amendments to the Federal Civil Defense Act required, however, that EOC's be developed on a matching-fund basis. We will be providing matching funds under a new approach and criteria which will seek to bring as many existing EOC's as possible to fully operational status by relatively low-cost modifications (e.g., providing certain communications or other essential equipment). This in turn required a different set of data, so the data provided for fiscal year 1982 are not the same as those provided for fiscal year 1981, as regards EOC's.

Also, the method of accounting for shelter survey status was changed between the two reports. For the fiscal year 1981 report, prepared in December 1980, survey projections were in terms of counties completely surveyed. In August 1980, we changed to estimates of the numbers of buildings surveyed (and remaining to be surveyed), regardless of whether a given county had been completely surveyed. This had the effect of substantially raising the percentage of facilities surveyed in risk areas.

Should similar data be provided in the future, we would anticipate an approach similar to that of the past two years. That is, we will in general compare the same data for identical program elements each year, thus maintaining a consistent approach. At the same time, where improved insights or approaches may suggest changes in data pertaining to a given element, we will introduce such changes. Also, more recent and accurate data, from management information systems, will be used where available. Thus evolutionary, not revolutionary, changes can be anticipated.

Senator WARNER. Mr. Estes, is this data provided to the Department of Defense in a timely and useful manner?

Mr. ESTES. The Defense Department received the information needed to assess the final fiscal year 1981 proposal early in January, 1980. The basic information used in the fiscal year 1982 final assessment was received in December, 1980, and updated in January, 1981. This allowed us to verify that the direction and extent of FEMA's planned progress for the fiscal years in question was indeed consistent with policy requirements. We believe that our ability to provide meaningful program oversight advice and assistance to the FEMA Director would be significantly improved if firm data were provided earlier. We recognize, however, that the progress estimates that FEMA develops for its annual program proposals are sensitive to changes in anticipated prior year funding, and that the amount of that prior year appropriation remains uncertain until the fall of each calendar year. Nevertheless, we believe that this uncertainty should neither paralyze planning for the following year's efforts nor preclude timely substantive consultation.

PROGRAM STATUS

Senator WARNER. Mr. McConnell, the fiscal year 1981 budget included considerable increases in the number of personnel for certain activities, i.e., radiological defense officers and exercises officers. If I look at the table on the status of the civil defense program included in the Department of Defense report, I see progress in the areas these people are assigned, i.e., radiological defense and direction and control exercising, but no increase in fiscal year 1982. Why is there no progress in fiscal year 1982?

Mr. McCONNELL. In the area of exercising, we expect to be providing exercising support at the same level in both fiscal year's 1981 and 1982, through the training and education delivery system. Our best estimates are that this constant level of support will suffice to provide on the order of 38 percent of the annual exercises required in the counterforce (CF) areas in fiscal year's 1981 and 1982, and 7 percent of those required nationwide. Also, if the same level of support were continued in subsequent years, it would presumably continue to provide some 38 percent of the annual counterforce exercising required, unless ways were found, as experience was gained, to provide more output (annual exercises) for the same level of input effort.

The same rationale applies to Radiological Defense Officer (RDO) projections. These remain constant in CF areas for fiscal year's 1981 and 1982 (on the basis

that the 31 RDO's anticipated in December 1980 to be provided for CF States would be 35 percent of the total number of RDO's currently estimated to be needed at the State and CF State-Area levels in those States). On a nationwide basis, however, RDO status is estimated at 12 percent of the need by end fiscal year 1981, but 18 percent by end-fiscal year 1982. This increase reflects the fact that the fiscal year 1982 program provides funding for additional full-time RDO's, one in each of the non-CF States. These additional RDO's will obviously result in providing a larger percentage of the total requirement for State and State-Area RDO's.

Senator WARNER. Mr. Estes, what role does civil defense play in our overall strategic policy? In Presidential Decision (PD) 41, President Carter outlined a civil defense policy that would enhance the survivability of the American people, enhance deterrence and stability, and contribute to the perceptions of the overall U.S. Soviet strategic balance and to crisis stability. Is this still the U.S. civil defense policy? When do you expect this review to be completed? Does the fiscal year 1982 budget request implement President Carter's policy? To what extent? Is there a commitment to civil defense within the Administration?

Mr. ESTES. As far as its role goes, the Department of Defense considers civil defense to be one element among many that affect the overall strategic balance between the United States and the Soviet Union. Obviously, it is not the only element. Nor is it the most important one. Civil emergency and industrial preparedness—the measures we take in the civil sector to improve our country's ability to mobilize quickly, to redirect manpower and material resources from peacetime pursuits to an integrated war-supporting effort, to improve our ability to transition quickly from a peacetime to a wartime environment and to sustain that posture under attack conditions—all of these things also affect the strategic balance. Views differ on the relative importance of each of these things. But it is generally agreed that all of them affect both perceptions and actual capability; and therefore our ability to achieve the most fundamental goal of our strategic policy, the deterrence of nuclear war.

At the same time, it is generally agreed that our civil defense efforts are not a substitute for our continuing reliance on strategic nuclear offensive forces as the preponderant factor in maintaining deterrence. That civil defense has a role, and that the role is not paramount is, therefore, generally accepted. Within these limits, opinions vary over how significant that role is.

Policy

As noted earlier, the Administration has temporarily reaffirmed PD-41. Therefore all of the cited goals contained in PD-41 reflect current policy.

Review

The civil defense program is one of a large number of programs currently undergoing review. Since this is a comprehensive and integrated review of programs and policies related to civil emergency preparedness as well as civil defense, we are unable to say at this time when it will be completed. Until it is complete further comment would be little more than speculation, and therefore inappropriate.

Fiscal year 1982 plans

FEMA's fiscal 1982 budget request implements the current Administration's current policy insofar as that policy is reflected in the temporary reaffirmation of PD-41.

Commitment

It is a matter of public record that the Administration has committed itself to support of a sound and well-managed comprehensive civil emergency preparedness and civil defense effort that will be sufficient for our forecast national security needs.

COOPERATION ON BUDGET FORMULATION

Mr. WARNER. Mr. Estes, Executive Order 12148 gives the Secretary of Defense and the National Security Council (NSC) oversight for the development of civil defense plans and programs to ensure that they are fully compatible with the nation's overall strategic policy. How would you characterize the cooperation between the FEMA, Defense, and the NSC on the civil defense budget? Do you have any recommendations on how to improve this process? What role did Defense

and the NSC have in formulating the fiscal year 1982 civil defense budget request? Does Defense concur in the request of \$134 million? How does Defense and the NSC perform their oversight role for civil defense? What action is the Department of Defense taking to ensure that civil defense resources are being expended for attack-related civil defense rather than peacetime disasters and that the primary priority remains attack-related civil defense?

Mr. ESTES. Cooperation has been satisfactory. As we have noted in our oversight reports, NSC, FEMA and Defense Department officials confer periodically on matters of civil defense content and funding.

Improvements

We previously stated that our ability to provide timely advice to the FEMA Director would be enhanced if data on contemplated funding distributions among program elements and on the increased percentages of program element completion that would result from these distributions were made available prior to December of each year. We also believe that interagency consultation earlier in the program budget formulation process would also improve the quality of oversight and coordination. We have, therefore, suggested institution of a formal coordination and consultation schedule during development of FEMA's annual civil defense program proposals. The process would begin each February with FEMA's drafting an initial policies and programs proposal, and distributing it for informal DoD and NSC review. It would continue during the spring and summer with regularly scheduled consultation over development and refinement of a program description document. It would end in September with a formally coordinated civil defense program package. This suggestion is currently under evaluation within DoD and FEMA.

Fiscal year 1982 request

On December 19, 1980, members of the NSC, OMB, DoD and FEMA staffs met to review FEMA's proposed fiscal year 1982 civil defense budget request. The meeting produced substantive changes in FEMA's proposal as a direct result of expressed DoD and NSC preferences. The submission was revalidated at a second meeting held February 12, 1981.

Concurrence

The Department of Defense supports FEMA's formal submission for fiscal year 1982.

Execution of oversight

The primary instrument for Department of Defense oversight is its annual review of FEMA's declared program objectives, proposed program element funding, and associated program element completion percentages. This data forms the basis for the Department's judgment of movement toward achievement of the crisis relocation capability called for in civil defense policy. After a judgment has been made, it is communicated to the FEMA Director and the NSC staff. The assessment is based on information provided by FEMA and on statements of national civil defense policy. In addition to the oversight guidance that emerges from this annual review, the Department also responds to all of the FEMA Director's requests for advice on matters of resource allocation and management. We understand that the NSC performs its oversight function in a similar manner using information provided by DoD and the Office of Management and Budget (OMB) as well as by FEMA.

Use of resources

Policy requires that civil defense programs should also help deal with natural disasters and other national emergencies. Department of Defense actions to assure the primary priority of attack-related civil defense deal exclusively with proposed allocations of fiscal resources, and consist of advice given to the FEMA Director, OMB, and the NSC staff, as well as commentary to the Armed Services and Government Operations Committees of Congress concerning provisions of proposed legislation that would affect that priority. The Department views control of the use of material civil defense resources to be properly a FEMA managerial responsibility. However, through comparison of the actual progress toward completion of program elements with the projected progress included in the prior year's budget proposal, we can gain a sense of any diversion of funds which detrimentally impacts the civil defense program.

ADEQUACY OF CIVIL DEFENSE BUDGET

Senator WARNER. Mr. Gallagher, what are the major programmatic differences between the current budget and the proposed fiscal year 1982 budget?

Mr. GALLAGHER. The fiscal year 1981 budget provides for maintaining the fiscal year 1980 level of effort in all States, and for accelerating crisis relocation planning for counterforce (CF) areas, as well as deploying various elements of an enhanced program in and near the CF areas. This proposed fiscal year 1982 budget provides for continuing the fiscal year 1981 initiatives while extending the crisis relocation planning effort to make a start on planning for the larger cities (risk areas with over about 1 million population), in which live over half the U.S. risk population.

Senator WARNER. What do you consider your highest priorities to provide an adequate civil defense program for this country?

Mr. GALLAGHER. Detailed analyses show that crisis relocation plans alone cannot be equated to the development of a capability to increase survival markedly by crisis relocation, to implement the policies for U.S. civil defense set forth in Presidential Directive 41 (which has been accepted and endorsed by the Reagan administration) and in the September 1980 Title V amendments to the Federal Civil Defense Act. The analyses indicate that "paper plans only" for crisis relocation, with no improvement in the operational systems required to achieve the full lifesaving potential of crisis relocation, would result in expected survival of some 46 percent of the U.S. population in a large-scale attack, as compared to some 39 percent with current CD capabilities. A balanced CD program is therefore required, including emergency operating centers, a system for assessment and analysis of radiological fallout hazards, and other systems and capabilities. Accordingly, we consider that priorities include development of crisis relocation plans together with essential operational systems, comprising a balanced and effective capability. One area of priority is to increase support for the State and local civil defense structure, on which we rely to develop capabilities where the people are, in communities throughout the U.S. This support had eroded by about 30 percent (in constant dollars) in fiscal year's 1977-81, and the fiscal year 1982 request provides for real growth of about 10 percent to redress in part this erosion over the past five years.

PROGRAM EVALUATION

Senator WARNER. How do you evaluate the current civil defense program?

Mr. GALLAGHER. Substantial progress has been made, but much more remains to be done.

NUCLEAR ATTACK SURVIVORS

Senator WARNER. If there were a nuclear attack today, how many people would survive? And how many people would be injured?

Mr. GALLAGHER. In a large-scale nuclear attack now or in the near future, given about a week of crisis in which to take various increased-readiness actions (e.g., dissemination of emergency information to the public via the news media), our analyses indicate that on the order of 90 million people would survive. A balanced CD program stressing crisis relocation capabilities could approximately double total survival, to some 180 million. On the order of 32 million people would be injured, roughly one-third of all survivors, including some 18 million suffering radiation sickness only, plus some 14 million suffering trauma or burns from direct weapons effects (blast and heat). About 5 million of the trauma and burn victims would also suffer radiation sickness. Given only about 2 uninjured survivors for each person injured or suffering radiation sickness, the prognosis would be poor for postattack recovery within a reasonable time. A balanced CD program stressing crisis relocation could reduce the absolute number of injured survivors to some 22 million. Moreover, due to the much higher level of survival, there would be roughly 7 uninjured survivors for each injured person, resulting in a much improved prognosis for eventual postattack recovery.

REX 80 BRAVO EXERCISE RESULTS

Senator WARNER. Mr. Gallagher, on page 3 of your statement you refer to a 13-day emergency exercise, Rex 80 Bravo. What strengths and weaknesses were seen in the civil defense program during the exercise (Rex 80 Bravo)?

Mr. GALLAGHER. Rex 80 Bravo was basically an exercise designed to test national mobilization plans and procedures during a time of increasing inter-

national tension. As such, no current civil defense programs were directly applicable to this activity. However, FEMA is currently developing a standby plan for the rapid enhancement of civil defense, which calls for completion within one year of all elements of a balanced CD program stressing development of crisis relocation capabilities. This enhancement concept and certain elements of the plan which would bear directly on a national mobilization effort were introduced into the exercise with mixed results, two examples of which were:

Because the enhancement plan would require the hiring of a large number of professionals nationwide and over an extremely limited time frame, problems in recruiting the necessary skills as well as conflicts with other manpower-related mobilization procedures became apparent as an area which needs resolution prior to implementation.

Some difficulties in obtaining necessary apportionment of critical supplies and resources to support enhancement were also experienced (such as materials for the rapid construction of necessary Emergency Operating Centers).

On the whole, and despite the fact that the duration of the exercise scenario did not permit full evaluation of the enhancement plan, it was clear that the rapid enhancement of civil defense is a feasible and necessary tactic which should and will be further developed by FEMA.

Senator WARNER. What changes have been made in the civil defense program as a result of the lessons learned from the exercise?

Mr. GALLAGHER. Other than the continued development of the plan for the rapid enhancement of civil defense based on the first introduction of this plan into an exercise, no other changes to current programs were seen as necessary. As pointed out earlier, the exercise was not specifically designed to fully evaluate or test current programs.

CRISIS RELOCATION

Senator WARNER. Mr. McConnell, on page 4 of your statement you note, "Traffic analyses suggest that our extensive transportation resources make crisis relocation a practicable option. At the end of the first day of movement, up to 60 to 70 percent of the 145 million people in U.S. risk areas could be evacuated to surrounding host areas; some 80 to 90 percent by the end of the second day; and about 95 percent by the end of the third day." On what information, other than traffic analyses, are these conclusions based? Could we do this today? If not, when?

Mr. McCONNELL. The conclusions as to cumulative percent evacuation are based primarily on traffic analyses. Evacuation of risk areas up to one-quarter to one half million population does not pose extraordinarily difficult problems, and this has been demonstrated repeatedly by experience in peacetime disasters requiring evacuation. For example, some 200,000 people were evacuated inland from Texas coastal areas in Hurricane Allan, 1980; some 500,000 from coastal areas in Alabama and elsewhere in Hurricanes David and Frederic, 1979; and 500,000 to 750,000 in Hurricane Carla, 1961. In all of these cases, evacuation plans had been prepared in advance and were implemented when the hurricane threat arose. However, a quarter-million people were evacuated because of a chlorine leak at Mississauga, Ontario (near Toronto) in 1979, even though no evacuation plan had been developed.

Evacuating the larger cities, however, is obviously a more difficult matter, and the estimates above are based on analyses made during transportation feasibility studies of crisis relocation in California and in the Northeast Urban Corridor (Washington, D.C. through Philadelphia, New York City, and Boston). There is no peacetime experience of evacuating such large cities, but the analyses examined in detail such extraordinary approaches as making some traffic routes one-way outbound, and tight control over access to freeways, as well as the use of rail, air and water transportation to supplement auto and bus movement on highways. We could not execute such an evacuation movement today, within the time periods stated. The current lack of plans would be a particularly severe constraint in the larger risk areas (some 37 risk areas of 1 million or greater population contain over half the U.S. risk population). To be able to meet the evacuation percentages estimated would require not only completing crisis relocation plans (estimated to take roughly the remainder of the decade, at the fiscal year 1981/1982 level of effort), but also developing a number of operational systems. These include direction and control, warning, emergency public information, and other systems, as well as periodic exercising for the key local and State officials who would be responsible to execute CRP's for both host and risk areas. The planning per se

needs to identify the specific portions of each risk area to be evacuated, the host area assigned to the risk area segment, the routes to be taken, identification of the number of people in the risk area without access to an automobile, and a plan devised for evacuating those without automobiles using other forms of transportation (e.g., buses, trains, boats, planes, etc.). When these planning activities have been completed, public information materials (e.g., newspaper supplements, TV films, radio announcements) need to be developed which will tell the risk area resident "where to go and what to do." Until such activities (which are part of the Crisis Relocation Planning effort) are completed, it is not likely that such an evacuation can be implemented. As relocation planning efforts proceed, the U.S. will improve its movement capabilities progressively. However, approaching the estimated percentages to which you refer will require a sustained effort in developing plans for the larger risk areas in particular, which will be a time-consuming matter.

Senator WARNER. Mr. McConnell, as I understand crisis relocation planning, there are three phases of planning: mini plans, initial plans, and enhanced plans. Why are there three levels of planning? And what are the distinctions between the three levels of planning?

Mr. McCONNELL. In the evolution of the Crisis Relocation Planning (CRP) concept, a decision was made to start development of initial CRP's, recognizing that detailed information concerning relocation by organization units and providing blast protection for essential workers was not yet available. Thus, the initial CRP's would be modified by later "enhanced" CRP's. Development of CRP's is a time-consuming effort requiring considerable planning detail to accommodate the lodging, feeding, and fallout protection requirements of the evacuees after movement from the risk area. Such planning (at current funding levels), is not likely to be completed before the end of the decade. If a crisis did occur before 1990, the United States would still not be fully prepared to evacuate its high risk population, much less take care of them after evacuation. To mitigate these adverse effects, it was proposed that State and local emergency preparedness personnel develop "mini" CRP's. The basic rationale is that while a severe crisis is not considered likely at this time, such a crisis could nonetheless occur. Thus, efforts to develop rudimentary (or "mini") CRP's could have significant payoff in terms of improved capability to cope with spontaneous evacuations that could take place, and in a net reduction of fatalities should deterrence fail and the United States suffer attack.

Initial CRP's for the nearly 3,300 local jurisdictions impacted by the 400 high risk areas in the U.S. focus on moving evacuees from risk areas, and providing temporary lodging, feeding, and fallout protection in the host areas. Initial CRP's do not, in general, identify in detail essential industries which must be kept operating during the evacuation period to support evacuees. "Enhanced" CRP's improve the level of planning—including identification of essential industries; onsite work with such industries to develop detailed plans for key worker identification, organizational relocation by other than essential industries; development and exercising of subsystems, such as school organizations for reception and care of evacuees; and planning for crisis actions to protect industrial equipment. The enhanced level of planning will improve confidence that CRP's could be effectively executed should the need arise, and that the evacuation posture could be maintained for extended time periods. "Mini" CRP's are rudimentary plans which contain several of the most essential elements of a full-scale plan. They are intended to provide an initial or rudimentary relocation capability, providing some improvement over having no plan, while not including the detail or sophistication of full-scale initial CRP's. They, in essence, provide the basis for more detailed planning included in the "initial" and "enhanced" planning effort. The 400 high risk areas in the U.S. impact on 3,281 local jurisdictions which require development of initial CRP's for the risk areas as well as the areas designated as host. As of September 30, 1980, State planners have indicated that 519 initial CRP's have been completed. Thus, there is a need for about 2,700 "mini" plans. As time goes on, this requirement for "mini" CRP's will decrease as full-scale CRP's are developed.

Senator WARNER. Mr. McConnell, what are the total number of plans required?

Mr. McCONNELL. Some 3,281 plans for separate jurisdictions.

Senator WARNER. What is the timetable for completing each phase of the planning?

Mr. McCONNELL. Completion of CRP's is dependent on the planning resources available. At the current level of planning (i.e., 205 planners in fiscal years 1981

and 1982), it is expected that initial CRP's will be completed by about 1990 and enhanced CRP's by 2003. In the meantime, "mini" CRP's (which are to be developed by State and local Emergency Management Assistance personnel) should be largely completed by end fiscal year 1982.

Senator WARNER. Provide on an annual basis the number of plans completed and the proposed schedule for completion.

Mr. McCONNELL. The data is as follows:

Type of plan	Number required	Number completed by end of fiscal year—			
		1979	1980	1981	1982
Initial CRP's.....	3,281	389	519	1,788	1,120
Enhanced CRP's.....	3,281	0	0	0	1
Mini CRP's.....	2,700	0	0	1,400	2,700

¹ Estimate.

² Approximate.

Senator WARNER. Have any of these plans been exercised? How many?

Mr. McCONNELL. When starting the CRP effort, primary attention was focused on plan development. In October 1979, guidance in conducting CRP exercises was provided to NCP planners. To date, 64 exercises have been conducted involving 216 CRP's. These exercises vary from "table top" (i.e., a 3-hour walk-through primarily intended for training and education) to a full-scale exercise wherein the CRP's are tested and evaluated over an 8-hour or longer period.

Senator WARNER. If these plans have been exercised, what are the major strengths and weaknesses in the plans?

Mr. McCONNELL. To date, some 216 plans have been exercised. Exercises were found to be especially helpful in acquainting local government officials and agency heads with their responsibilities in carrying out CRP assignments. Generally, exercises showed that plans could be implemented, and that host organizations were able to handle the evacuee reception and care functions.

Some of the plan weaknesses identified during the exercises included:

The Spokane, Washington, host area CRP's did not clearly identify that local government officials were in charge of the host area operations during the evacuation phase.

Some of the plans lacked information regarding the availability and location of radiological monitoring instruments.

Many plans did not provide information on resources from the risk area to be made available to local governments in host areas.

Details on shelter upgrading in host areas (i.e., how each building was to be upgraded to provide improved fallout protection) were lacking, as well as operational details on how the community resources were to be marshalled to effect the upgrading.

Senator WARNER. Provide a breakout of the fiscal year 1982 civil defense request that is devoted to crisis relocation.

Mr. McCONNELL. The fiscal year 1982 budget submission includes the following activities to develop crisis relocation plans and to conduct other activities which provide direct and indirect support:

	Fiscal year 1982 (in millions)
Nuclear civil protection.....	\$8.3
Shelter survey ¹	3.7
Crisis shelter upgrade ¹	.4
Emergency instructions for public ¹	.2
National security research ¹	2.0
Policy development ¹	.4
	15.0

¹ CRP supporting activities.

Senator WARNER. How much has been spent on crisis relocation to date?

Mr. McCONNELL. Crisis Relocation Planning was implemented in fiscal year 1976 as a nationwide operational program following extensive research and prototype studies. Since then, approximately \$63 million has been expended in a 6-year period through fiscal year 1981. The fiscal year 1981 submission was

\$13.1 million which included research, systems development, shelter survey, in addition to direct crisis relocation planning. The latter planning effort per se, for fiscal years 1976 through 1981, totals \$26 million.

MINI-CRISIS RELOCATION PLANS

Senator WARNER. Mr. McConnell, on page 7 of your statement you note that a decision was made in June 1980, to develop "mini" crisis relocation plans for the 3,300 risk and host jurisdictions requiring relocation plans. Was this program ever discussed with the Congress?

Mr. McCONNELL. The "mini" CRP program was not discussed with the Congress prior to implementation. The task was to be accomplished almost wholly by State and local civil preparedness personnel funded under the FEMA Emergency Management Assistance (EMA) program (wherein the Federal government provides up to 50 percent of State and local salary and administrative expenses). The "mini" CRP activity was viewed as a nuclear attack preparedness planning task which was an approved activity, within the purview of the FEMA program under the law from which it stems. Also, the program was developed in April-June 1980, after congressional hearings on the fiscal year 1981 program. The "mini" CRP program has, of course, been discussed in our fiscal year 1982 budget justification and hearings.

Senator WARNER. Was this decision made as a result of questions raised during the hearings on the fiscal year 1981 civil defense authorization request where the main focus on that budget was directed towards only 7 million people living in the counterforce areas rather than the more densely populated areas.

Mr. McCONNELL. The decision to implement the "mini" CRP program was made because "mini" CRP'S:

Give added protection now—not in 1990.

Provide a limited capability to deal with spontaneous evacuation.

Have a potential for saving several million lives.

Provide a basis for crisis actions to add detail to the rudimentary "mini" plans.

The fiscal year 1981 civil defense authorization hearings did not impact on the decision, though the "mini" CRP program will help to demonstrate the viability of the emergency management structure of the State and local governments which are supported by the EMA funds.

Senator WARNER. What impact will this have on initial crisis relocation planning?

Mr. McCONNELL. The impact of the "mini" CRP program on the crisis relocation planning effort includes the following positive elements:

Local civil defense and other government officials become directly involved and are brought into the planning effort at an earlier stage.

Rudimentary CRP's are developed which can provide the basis or foundation for subsequent more detailed CRP's later on by State planners.

If an international crisis occurred within the next several years, the U.S. would have a rudimentary capability to evacuate rather than having to wait until the end of the decade for full-scale CRP's to be available.

"Mini" CRP's are to be accomplished for those areas where full scale CRP's have not yet been initiated and are therefore supportive to the overall CRP effort.

Senator WARNER. Why wasn't this program initiated earlier in the civil defense program?

Mr. McCONNELL. When the CRP program was initiated in fiscal year 1976, there was insufficient experience to provide a valid estimate of the time required to complete host, risk, or combined risk-host CRP's. After several years of planning experience, and recognition that development of initial CRP's is a time consuming operation, it became apparent that under the current planning approach, the U.S. would not be able to complete initial CRP's prior to the end of the decade. Thus, should a severe international crisis occur prior to that time, the U.S. would be unprepared if evacuation were to be considered. It was not until 1980 that FEMA officials recognized this deficiency in the planning effort and devised the "mini" CRP program as an interim solution. FEMA officials discussed the proposed "mini" CRP program with State and local civil defense representatives in April 1980, and a decision was made to proceed with the program.

Senator WARNER. According to a memorandum provided to the committee, mini crisis relocation plans will take two to three weeks of effort. Why then will it take until the late 1980's to produce initial crisis relocation plans?

Mr. McCONNELL. The time required to complete "mini" CRP's will depend upon the size of the community evacuated, the availability of resources to shelter and feed evacuees and provide fallout protection, and the capability of civil defense personnel doing the planning. "Mini" CRP's can be accomplished in several weeks of effort for smaller communities where the evacuation and hosting problems are not severe. However, for larger communities, more time will be required. It should be recognized that a "mini" CRP is, in essence, a rudimentary and incomplete plan. It contains only a few of the most essential elements of the full-scale CRP and therefore can be developed in a shorter period of time. For example, most "mini" CRP's provide for evacuation of only those risk area residents with their own automobiles. Detailed planning for transporting those residents without vehicles by using buses, trucks, trains, planes, or boats cannot be done at the "mini" level. Likewise, detailed planning for redirecting the existing resource distribution system for such items as food and fuel cannot be included in the "mini" CRP effort. Planning in such areas is why the full-scale CRP is time consuming. However, such detailed planning is required for the plans to be credible, and to have confidence that plans would be executed quite effectively and the risk population sustained in host areas for up to two weeks.

ENERGY MANAGEMENT ASSISTANCE

Senator WARNER. Emergency Management Assistance (formerly personnel and administration) provides 50 percent federal funding for state and local employees who are employed to deal with all kinds of emergency, including but not limited to war caused disasters. This program accounts for one-third of the civil defense budget. The fiscal year 1981 level for emergency management assistance was held at the fiscal year 1980 level. According to testimony before this committee last year, "the decision was made to hold the funding at the same level until a study could be made to determine if the emergency management assistance program was being properly managed and if the funds were being used in the most effective manner." The fiscal year 1982 request includes \$44.6 million or a \$7 million increase over the fiscal year 1981 level. What findings in the study justify an 18 percent increase?

Mr. McCONNELL. The 18 percent or \$7 million increase is not directly related to the "study". Rather, it was our estimate of what would be required to staff all counties and cities of more than 50,000 population to the "standards" level for emergency preparedness capability. With inflation, however, the requested amount will still be considerably short—as is apparent when compared with needs estimated by State and local governments. The study mentioned never progressed past a "Reaction" survey that sought opinions on several alternative approaches. Eight strawman "conclusions" or options were presented for comment within FEMA. The results were inconclusive, as none of the options was viewed as feasible except to the extent already in effect.

Senator WARNER. On page 15 of your statement you note, "New and more effective management approaches should assure maximum return on the matching funds provided to State and Local governments." What are these new and more effective management approaches?

Mr. McCONNELL. We want to place even greater emphasis on evaluation—both by the State and localities themselves and by FEMA on the basis of Program Papers, Program Status Reports, the Standards, and Performance. Within our limited Regional staff resources, we want to increase monitoring and technical assistance. Over the next several months, we shall be updating the "standards." This will serve to refine the program/paper program status report information system. Over the next year, we want to improve upon the system that we now have, in order to measure accomplishments towards goals rather than to focus upon numbers of work years funded, and staffing numbers of full-time and part-time employees. In fiscal year 1981 and for fiscal year 1982 FEMA (P&P) has refined the national program emphasis paper to include quantitative objectives, revised by negotiation with States and monitored by periodic reports of progress made to achieve the negotiated goals.

Senator WARNER. In a memorandum provided to the committee outlining the mini crisis relocation plans program the statement is made, "The time has come for us to demonstrate conclusively that the emergency management assistance program can produce a tangible end product that improves readiness—in this case mini crisis relocation plans." Does this mean that there was nothing definitive or tangible for these people to do prior to the mini crisis plans program?

Is the purpose of the mini crisis relocation planning to provide justification for the emergency management assistance program? The memo further states that perhaps two or three weeks of effort will be needed for the average mini crisis relocation plan. What will these people be working on the remainder of the time?

Mr. McCONNELL. A "mini" crisis relocation plan is one "tangible end product" needed by all risk and host areas, whether or not they are supported by Emergency Management Assistance (EMA) funds. The EMA program offered us some average and a starting point. The purpose of EMA is not simply to turn out "products" in the sense of plans or other issuances. Basically, EMA helps State and local governments to carry out their day-to-day emergency preparedness responsibilities and to maintain and enhance their capabilities for response to nuclear attack and other emergencies. While the program pays for people and the administrative resources they need to do their job, the participants are measured by performance to achieve reasonable preparedness goals. Participation Governments, their agency staff and volunteers develop and implement plans and procedures, guidance, training, public information and other preparedness measures as well as the needed leadership and management of that preparedness. These activities constitute the bulk of the day-to-day work of EMA-funded staffs.

Senator WARNER. The budget documentation shows that the number of people hired under this program will be increased by over 3,000 or a 52 percent increase. What will these individuals be doing? How much of their time is devoted to civil defense, how much for other disasters? What measures do you take to ensure that the majority of their time is devoted to their primary responsibility, attack-related civil defense? How can such a large influx of new employees be effectively and efficiently brought into the program?

Mr. McCONNELL. The 3,000 increase was the result of an error in the printed budget justification. A corrected sheet was prepared and submitted. The correct total figure is 6,800, an increase of 962, or 16 percent. These individuals will be added to existing staffs and represent new participants' staffing. We do not and cannot make a distinction between "civil defense" time and comprehensive emergency preparedness time. Very few preparedness activities can by definition produce benefits restricted to certain types of emergencies. The Title V amendment to the Federal Civil Defense Act in 1980 recognizes this. There are, however, prescribed limits on how much staff time can be spent on post disaster recovery operations, and there are absolute restrictions on nonemergency preparedness activities.

Senator WARNER. The Emergency management assistance program for fiscal year 1982 will support 6,800 positions—4,140 full-time employees and 2,660 part-time employees. How do you determine the ratio of full-time and part-time employees? How do you measure the productivity of these employees? Why is there a part-time employee program?

Mr. McCONNELL. The ratio of full-time positions to part-time positions is based on historical records. FEMA does not establish the ratio. The State and local governments determine to what extent their needs are best met by full-time or part-time staff. FEMA is concerned with evaluating results in relation to staff years of effort. There is no specific part-time employee program. Many small local jurisdictions require only a part-time emergency management staff because their requirements and programs are not complex. Others that require a full time staff cannot afford it and the part-time staff serves to promote and attract volunteer efforts. FEMA evaluates local operational capability, through, the Program Status Report and the Local Program Paper. The local governments evaluate, their capability to operate in nuclear attack, peacetime nuclear accidents and natural disasters. A separate and independent evaluation is made by FEMA on the basis of objective criteria for the same three categories of emergencies. A recent analysis showed that the local and FEMA evaluations were closely paralleled and it revealed that:

EMA participants had better overall operational capability than non-EMA Participants.

EMA participants had better nuclear war and natural disaster preparedness capability than non-EMA participants.

Non-EMA federally assisted government reflected regressions in operational capability, with the greatest impact on nuclear war capability.

Senator WARNER. What portion of the fiscal year 1982 budget request provides grants, contracts, etc. either partially or fully funded by federal funds?

Mr. McCONNELL. \$80,844,000 or 60 percent, of the \$134,000,000 civil defense budget provides grants and contracts to the States either partially or fully funded by federal funds.

Program	Percent Federal funding	Amount (thousands)
Emergency management assistance.....	50	\$43,940
Supporting materials/maintenance and services.....	50	6,772
Emergency operating centers.....	50	6,545
Radiological defense.....	100	9,950
Nuclear civil protection.....	100	13,637
Total.....		80,844

Senator WARNER. The Federal Civil Defense Act limits federal contributions to \$40 million for personnel and administrative expenses. The personnel and administrative account has been redesignated as emergency management assistance. The fiscal year 1982 request is \$44.6 million and therefore exceeds the ceiling. Will legislation be proposed to increase the ceiling? When will this legislation be sent to the Congress?

Mr. McCONNELL. Legislation to increase the Emergency Management Assistance ceiling to \$47 million was sent to Congress March 23, 1981. It is important to note that in fiscal year 1981 Congress combined "Maintenance and Services" with EMA and authorized both under Section 205. The ceiling therefore is needed for the \$44,600,000 for EMA plus the \$2,297,000 for M&S.

EMERGENCY OPERATING CENTERS

Senator WARNER. Emergency operating centers provide direction, control and communication for nuclear as well as peacetime disasters. Last year, the committee adopted a provision that was enacted into law that requires that emergency operating centers be funded by 50 percent matching State funds rather than 100 percent federally funded as proposed by FEMA. The emergency operating centers program has been under critical review by the Congress for the past several years. The fiscal year 1981 presentation stated that the \$5.5 million requested would upgrade 25 facilities and construct 12 new facilities. However, when inquiries were made if this was still the intent of the program, the response was that more details were needed. The fiscal year 1982 request is for \$7.4 million, yet there are no specifics on what will be accomplished with these funds. Why should these funds be approved when there are no specific details as to what will be accomplished?

Mr. McCONNELL. The fiscal year 1981 presentation referred to in the question relates to the proposed 100 percent funding of emergency operating centers where FEMA could actually plan and determine the EOCs to be developed. The 50-50 matching fund program approved by the Congress requires applicant initiative. FEMA management is based on priorities and criteria to select from submitted applications. We want the focus of the EOC program to be on increased EOC operational capability, rather than facilities constructed or modified. Rather than counting such facilities, we are measuring all of the features that contribute to that capability. Finally, our criteria is designed to equalize the cost to FEMA whether a new facility is required, or whether we are modifying an existing one. The real cost benefits will be the EOC upgrades that capability features at the least cost. The fiscal year 1982 budget submission provides more specific details on the nature and extent of deficiencies that require attention than previously submitted in support of EOC funds. It clearly shows the magnitude of the need. Without EOC and the resulting direction and control capability, the plans for Nuclear Civil Protection and for other emergency operations cannot be effectively executed.

Senator WARNER. Last year Congress approved the full appropriation of \$5.5 million for emergency operating centers and adopted a provision that requires 50 percent matching State funds rather than 100 percent federal funding. As a result of the matching funds requirement, will you accomplish twice as much?

Mr. McCONNELL. Under the matching funds concept, we definitely expect to accomplish more in the long term. The result should be a more efficient use of funds. The new approach focuses on and emphasizes correcting deficiencies and adding only necessary operational features.

Senator WARNER. Two years ago, a seven year program for EOC's was presented that total \$312 million to upgrade 1,662 EOC's, to construct 509 EOC's and to equip 1,124 EOC's. Currently, what is the total program projected for

EOC's? How has it changed from the initial program? How many emergency operating centers are currently operational?

Mr. McCONNELL. Approximately 5,600 reporting jurisdictions indicate a need for an EOC, of which 3,010 report having some type of operational capability. This capability varies from being extremely limited, such as having perhaps only a minimal communications capability, to those having a total operational capability. Approximately 1,000 EOC's are considered to be operational. The present program, as mentioned in the answers to the above questions, emphasizes development of operational systems capabilities. The present program is risk oriented and prioritized, with State and State areas having priority of local EOC's and host areas having priority of risk areas. A cost benefit analysis will be used to establish priorities among projects. Concurrently with the development of the program, improved management capabilities are being developed to include improving program status reporting, better defining of the program to require EOC funds to be used only in development of systems, and the Maintenance and Service program to maintain the systems. In addition, a Statewide EOC development plan is to be prepared and maintained by each State which will show total EOC requirements, deficiencies, and estimated costs by priority for development.

Senator WARNER. FEMA proposes to permit States to satisfy their "matching funds" requirement as required by Section 703 of Public Law 96-342 by contributing land and or buildings in lieu of cash contributions. Would you explain how this will be applied.

Mr. McCONNELL. The "in-kind" provision is consistent with OMB Circular A-102 and thus represents a practice and procedure not limited to FEMA. Our application however, will be designed in terms of our EOC authorization and our criteria. Accordingly, where an applicant has already funded an EOC facility feature, with his own funds, such as emergency generator, fuel tank, additional mass to obtain a fallout protection factor, and such features meet FEMA EOC criteria, we will permit the applicant to apply such cost toward the costs of new allowable feature as "in-kind" cost sharing.

PUBLIC INTEREST

Senator WARNER. Mr. Gallagher, one of the points I raised in last year's civil defense hearing was the importance of stimulating public interest in this program. Do you have any recommendations on how we can get the public interested in civil defense?

Mr. GALLAGHER. The public is interested in civil defense, but this interest is not intense in normal times. Numerous public opinion surveys over the years (over 300) show consistently and conclusively that while the American public think little about civil defense in normal times, they nevertheless indicate interest in and approval of civil defense at high ("consensus") levels when asked. Moreover, it appears that one of the reasons that the public does not demonstrate greater interest in civil defense is because they believe that their governments are "taking care of" civil defense. In fact, the average estimate of effort thought to be devoted to U.S. civil defense is about \$1 billion annually—an overestimate by a factor of ten.

Besides public opinion polls, there are numerous other indications of public interest in civil defense. Over 30 million copies of the civil defense publication "Survival In the Nuclear Age" have been distributed to meet citizen needs. Also, since President Reagan assumed office the White House has received more than 300 letters from citizens urging strengthening of U.S. civil defense.

In the past, when funds were available for volunteer and citizen training programs, millions of citizens availed themselves of these opportunities. At one time, a volunteer Civil Defense Corps of over 4½ million citizens existed. During the 1960's, over 20 million citizens, for example, took just one of the many civil defense training courses available at that time—the Medical Self-Help Course of approximately 12 hours. Large figures could also be cited for other training and education programs in such areas as radiological monitoring, shelter management, rural civil defense, and Personal and Family Survival. During the 1970's, however, these programs were discontinued because of fiscal constraints.

What this past experience, and current citizens interest, indicates is that if a decision were made to enhance the civil defense program, citizen participation in training and education programs would not be a problem. Citizens interest exists and can be tapped for participation in civil defense training and education programs and in volunteer activity if resources are made available to maintain these structures.

Senator WARNER. How can we best get this information to the public?

Mr. GALLAGHER. Citizen information and training and educational courses must be available at the local area—where the people are. This can be done through the local government, the school and educational system, volunteer and service organizations such as the Red Cross and the Scouts, and through Federal extensions such as the USDA County Agents. In the past, when funds were available for such programs, all these (and other) avenues were used. In addition, FEMA is in the process of developing home (self-study) correspondence courses which past experience has proven to be a successful vehicle.

Recently, we took another action in keeping with the concept of developing interim capabilities pending completion of more effective and expensive systems. We know from past experience that in times of perceived tension, such as the Cuban missile crisis and the more recent invasion of Afghanistan, the public become concerned about getting survival information, and demand for civil defense literature escalates rapidly. Stocks of booklets describing the effects of nuclear weapons, and shelter and other means of protection, are quickly depleted.

Accordingly, in January 1981 we distributed to State and local civil defense offices a set of 15 newspaper columns, covering attack effects and means of protection. These columns are in camera-ready form, and could be published in newspapers quickly at a time when stocks of booklets would be inadequate to meet the public demand.

Senator WARNER. In areas where you have crisis relocation plans, how many of the citizens know what these plans are?

Mr. GALLAGHER. While FEMA has not taken citizen surveys on this subject, we believe the number of citizens who are aware of their evacuation plans to be quite low. For reasons of cost effectiveness, the current approach is to provide crisis relocation maps and instructions to the public during a time of crisis via newspapers, the radio, and television. Obviously, it would be desirable to have crisis relocation information readily available rather than having to publish and distribute such information during an acute international crisis. For this reason, FEMA in 1981 is testing approaches for providing such maps and instructions for crisis relocation in telephone books, as is done in Sweden and Norway. Thus far, two such telephone directory inserts have been completed, for the Plattsburg, New York, and Limestone, Maine, risk areas—both being counterforce areas. In addition, FEMA is requesting \$200,000 in its fiscal year 1982 budget to provide such maps and instructions for the public in up to 200 additional areas.

RESEARCH AND OTHER STUDIES

Senator WARNER. Mr. McConnell, what are the fiscal year 1981 and fiscal year 1982 levels of funding for studies and analyses?

Mr. McCONNELL. The levels are as follow (not including personnel costs):

(Dollar amounts in millions, by fiscal years)

	1981	1982
National security research.....	\$6.4	\$6.0
Policy development.....	2.1	2.9

In general, research seeks to develop new or improved ways to mitigate the impact of enemy attack on the U.S. population, economy, and leadership. Developmental projects take research results and, through a process usually involving local field-test, develop guidance and training packages to the point of readiness for deployment by the Regional and State offices. One current example of this research/developmental approach is in the area of crisis actions to develop additional fallout protection in host areas, for urban evacuees. Analyses have indicated that such actions have potential to add some 17 million survivors in a large-scale attack, when functioning in conjunction with other elements of a balanced CD system. Research undertaken in fiscal year 1978-79 developed approaches for upgrading the fallout protection of existing buildings in host areas (by placing earth shielding beside and on top of the buildings), including methods for providing additional supports to carry the added overhead burden. A current developmental project is developing and testing a guide to permit planners to develop the necessary plans to give confidence that suitable buildings could and

would in fact be "upgraded" during a period of intense crisis, using the research results as a major input; to development of the planners' guide.

Senator WARNER. Can you outline the policy or program changes which have been made as a result of studies undertaken by FEMA in the past 3 years?

Mr. McCONNELL. The most significant policy or program changes were made based on studies undertaken by FEMA's predecessor agencies prior to the past three years. The policies set forth in Presidential Directive 41 of September 1978 include the direction that the U.S. civil defense program should achieve a capability for relocating the population of metropolitan and other potential risk areas during a period of acute crisis. The National Security Council and DOD studies which provided the basis for PD-41 included design of a balanced program to achieve crisis relocation capabilities (sometimes called "D-Prime"), and this program was designed on the basis of research and developmental activities over the preceding 10 to 15 years. Studies and analyses conducted more recently have resulted in the following policy or program changes, among others:

Program "D-Prime" has been updated twice since its original design in 1977. The most recent update (March 1981) includes provision for a survivable, mobile, low-frequency radio warning system, based on analysis and design during the past 3 years.

A project is currently underway in Goldsboro, North Carolina, (near Seymour Johnson Air Force Base, a SAC base), to develop a more effective approach to planning for crisis relocation. This provides for assigning risk area residents to specific host area locations on the basis of their employment affiliation. This "organizational relocation" approach is intended to reduce the impact of crisis relocation on host areas, which in general have modest governmental structures and capabilities. It is based on research by Boeing Aerospace and others.

In January 1980 FEMA distributed to all State and local offices a set of 15 articles on nuclear attack effects and shelter and other means of protection. These are in camera-ready form, suitable for local newspaper publication during a crisis. Our analyses suggest that such crisis publication of Emergency Public Information material could result in adding on the order of 8 to 12 million survivors. The content of the columns is based on analyses and studies identifying the payoff of a number of actions such as putting shelterees in the best protective posture against fallout and, in potential risk areas, against blast as well.

In February 1981 FEMA published and distributed to State and local offices a revised "Shelter Management Handbook." This too stresses actions with high lifesaving payoff, based on the analyses identified in the preceding item. The same concepts are being stressed in additional Shelter Management materials.

More examples could be provided. In general, all of FEMA's currently deployed CD programs can be traced directly to R&D in the recent or less-recent past. The research and developmental cycle is continuous, and is essential to developing and improving the program, in terms of both cost and effectiveness.

CIVIL DEFENSE COMMUNICATIONS

Senator WARNER. How do you evaluate civil defense communications capabilities?

Mr. McCONNELL. State and local civil defense communications capabilities are evaluated by the use of two information systems, the Emergency Communications Development Plan (ECDP) and the Program Status Report (PSR). The ECDP plan forms the basis for the development of a communications system to effectively support emergency operations. It provides State and local officials a method by which they may inventory existing resources, develop a concept for utilization of these resources to support emergency situation requirements and plan for orderly development or improvement of their respective system. The ECDP plans are filed in the FEMA regional offices. State and local governments are encouraged to update their plans as their civil defense communications capabilities and requirements change. The PSR is an annual report that provides information on a spectrum of civil defense capabilities, such as emergency operating centers, emergency public information, and communications at the State and local levels of government. This type of information is reported on all States and territories, as well as approximately 5,600 local governments on an annual basis. Specifically, in the EOC communications area, the PSR provides information on the radio capability existing between each EOC and primary operating forces, other forces, broadcast media, next level up, and adjacent jurisdictions.

Senator WARNER. What efforts are underway to improve communications?

Mr. McCONNELL. There are four complementary programs that address the improvement of emergency communications at the State and local levels of government. They are:

Communications and Warning Policy, which provides guidance, technical assistance, and planning assistance.

Supporting Materials, which provides Federal matching funds for the enhancement of emergency communications.

Emergency Operating Centers, which provides Federal matching funds specifically for communications to link emergency operating centers with primary operating forces, other forces, broadcast media, the next level up of government, and adjacent jurisdictions.

Maintenance and Services, which provides Federal funds for recurring costs, such as monthly line charges, maintenance and repair of communications equipment no longer operational or impractical to maintain or repair.

SHELTER STOCKS

Senator WARNER. The budget request includes \$.5 million for shelter stocks. What items will shelters be stocked with?

Mr. McCONNELL. Shelters will be stocked with the following: a 350-gallon collapsible water container; sanitation kit containing: commode chemicals, toilet tissue, liners, cups, sanitary napkins, and a few other items; and collapsible commodes.

Senator WARNER. What will be the total cost?

Mr. McCONNELL. The total shelter stocking requirement is to provide supplies for 140 million spaces (people). At approximately \$1.50 per space, the total cost is \$210 million in current dollars. The fiscal year 1981 and fiscal year 1982 budgets are for development and production engineering. Actual mass production is not feasible at the current overall civil defense budget level.

Senator WARNER. After these items are produced, where will they be stored?

Mr. McCONNELL. Our current thinking is that the supplies will be centrally stored in or near host areas throughout the United States. Supplies must be located so that they can be dispersed to shelters in target areas if circumstances warrant, or be distributed in host areas if Crisis Relocation is implemented. It is anticipated that supplies will be stored in Federal facilities, or with commercial sources with strict control and supervision as a last resort.

Senator WARNER. How will they be distributed and moved to shelters?

Mr. McCONNELL. Storage facilities must have the capability to handle the redistribution of supplies on an expedited basis. Plans will be developed with the States and local governments for crisis dispersal of supplies to shelter locations.

Senator WARNER. Do you plan to stock food or medicine?

Mr. McCONNELL. There are no plans to stock shelters with food or medicine. Food and medical supplies are not considered critical to short-term survival, whereas lack of water can drive people out of shelters in a few days. Also, food and medical supplies have a relatively short shelf-life and would require a much greater expenditure of funds to stock and maintain than the water containers and sanitation kits that are minimum essential stocks. Newspaper articles have been prepared and disseminated for local use in a crisis period to give the public more specific guidance on food and other supplies (including required medicines) to take with them to shelters. Local governments are responsible for acquiring supplies locally during a crisis period to stock public shelters, and some jurisdictions have developed these procedures.

SOVIET CIVIL DEFENSE

Senator WARNER. According to the CIA, the Soviet civil defense program is beset by bureaucratic difficulties and apathy by a large part of the population, which has skeptical attitudes about surviving a nuclear war and which does not take the program seriously. How do you evaluate the Soviet civil defense program?

Mr. McCONNELL. FEMA is not responsible for evaluating Soviet civil defense. That is an intelligence function. However, we are of course aware of the 1978 unclassified publication on Soviet civil defense by the Director of Civil Intelligence (DCI) which was in fact reproduced by this Subcommittee one year ago. The report notes that the Soviets devote to civil defense roughly 20 times the resources that the U.S. does, in terms of both full time personnel and funding. In addition to their program of evacuation planning, the Soviets are also actively

engaged in building blast shelters nationwide. According to the 1978 report, the Intelligence Community were aware of "more than 15,000 blast-resistant shelters" of sufficient size to accommodate roughly 15 million people (not including the blast shelter protection afforded by the Soviet subway system). The U.S. has no comparable program. As to Soviet citizen skepticism and compliance, the report states:

The peacetime effectiveness of the civil defense organization suffers at times from the reluctance of industrial officials to spare labor and other resources for civil defense and from misunderstandings between civil defense officers and Soviet civilians. In wartime, increased centralization of authority would probably reduce many of the bureaucratic inefficiencies inherent in this large organization. But the fact that the organization exists, despite its problems and the fact that progress is being made toward fulfillment of the objectives of the civil defense program give Soviet civil defense leaders some confidence in their ability to function as required. On the whole, the Soviets' view of their civil defense organizational structure probably is a favorable one—overall, better than it was before the military assumed control of it in the early 1970's. The Soviet leaders' emphasis on civil defense also offers the potential to foster favorable popular attitudes toward the Soviet system, to demonstrate leadership concern for the people, and to lend credibility to calls for vigilance against potential enemies. Nearly every Soviet citizen receives civil defense instruction either in school or through training courses, lectures, and exercises at places of work. Public attitudes about surviving a nuclear war remain skeptical, however, and there is evidence that many people do not take the program seriously. Nevertheless, the Soviet people would respond to directions from civil defense authorities.

Senator WARNER. According to the CIA, the Soviet civil defense program is beset by bureaucratic difficulties and apathy by a large part of the population, which has skeptical attitudes about surviving a nuclear war and which does not take the program seriously. How do you evaluate the Soviet civil defense program? Would you trade the U.S. civil defense program for the Soviet program? What have you learned from your most recent research on Soviet civil defense?

Mr. ESTES. Evaluation of Soviet civil defense involves correlation of the best available evidence of what the Soviets are saying and doing. Given the closed nature of Soviet society, this evidence is often fragmented and ambiguous. Some observers believe, therefore, that the evidence is too tenuous to be used as a basis for firm projections. Others, however, note that it is all that we have. Therefore rigorous analytical techniques must be applied to reduce as far as possible uncertainties that result from extrapolation of sampling data.

Evaluation

Although views differ over the efficiency and effectiveness of the Soviet civil defense program, there is general agreement that the Soviets have had a large scale program underway for some time, and that supporting elements of that program have been deployed. The program is designed to improve: The ability of the leadership, the essential work force, and the rest of the population at large (in that order of priority) to survive a nuclear attack; continuity of economic activity in wartime; the capability for recovery from the effects of war.

Although some aspects of civil defense activity have been marked by bureaucratic difficulties and public apathy, there has been a general trend of improvement in almost all facets of the Soviet civil defense program over the past decade.

Trading programs

The Soviet civil defense program is a comprehensive effort tailored to factors peculiar to Soviet demography and the politico-economic infrastructure of Soviet society. Although there is a marked similarity between the concepts of sheltering and crisis evacuation that characterize both Soviet and U.S. programs, there are appreciable differences in the way the programs are controlled and managed.

The Soviets have made an extensive effort, and have shown marked, if uneven, progress in the development of plans and shelter facilities. In absolute terms, this effort reduces the number of fatalities that otherwise would be expected incident to a nuclear attack. The size of the expected reduction, however, is sensitive to assumptions about the attack scenario, the amount of warning available, the efficiency with which sheltering and evacuation plans are executed, and the extent to which dispersal can be sustained over a protracted period. [Deleted.]

The Soviets have devoted substantial resources to civil defense. Notwithstanding the uncertainties [deleted].

Senator WARNER. Would you trade the U.S. civil defense program for the Soviet program?

Mr. McCONNELL. Trading programs is of course not possible. Several points can be made, however. First, the pace and level of the U.S. civil defense program is determined by program and budget decisions which to date have resulted in a U.S. level of effort roughly one twentieth of the Soviet level of effort as described in the 1978 unclassified DCI report. The result is that expected survival in a large scale current to mid-1980's nuclear exchange is estimated at about 40 percent for the U.S. vs. 90 percent for the USSR (assuming time for the Soviets to implement their population plans), according to the aforementioned DCI report. Moreover, it is estimated that roughly one-third of the U.S. survivors would be injured or suffering radiation sickness. (Note: In May 1980, CIA published a classified reassessment that substantially alters some of the views expressed in the 1978 unclassified publication.)

Should a decision be made to deploy an enhanced U.S. civil defense program stressing crisis relocation plans and the associated operational systems required, the expected U.S. survival would improve to roughly 80 percent of the population in a large scale attack—given several days in which to implement crisis relocation.

Further, such a program would not require resources comparable to the current Soviet program. Rather, the U.S. program would involve an average annual per capita expenditure of 15-20 percent of the Soviet average annual per capita expenditure. The average annual cost over a 7 year period would be about \$1.65 per capita in fiscal year 1982 dollars as compared to at least \$8.00 per capita in the Soviet Union in fiscal year 1976 dollars.

To deploy a civil defense program equivalent to that of the Soviet Union, the U.S. would need to construct blast shelters for key workers and leadership elements down to city and county level, stockpile food, and develop an industrial protection program, among other things. Over a number of years this would further increase expected survival, though at a much higher per capita cost than is currently envisioned for the crisis relocation program.

There are certain features of the Soviet program which would not be appropriate in the U.S., such as the massive mandatory Soviet training program. According to the 1978 DCI report, "Nearly every Soviet citizen receives civil defense instruction either in school or through training courses, lectures, and exercises at places of work." While such frequent and mandatory training is inappropriate for the U.S., our experience in the 1960's and early 1970's indicates that a substantial percentage of the population will take training and avail themselves of educational materials if these are provided by the Federal government. In fact, the provision of training and educational programs is often viewed as part of the Federal responsibility for providing for "the common defense."

Therefore, if the U.S. were to undertake a program at least partially comparable to the Soviet program, the current asymmetry in expected survival (i.e., 40 percent versus 90 percent) would be largely redressed. Achieving a capability for the crisis relocation of the population of metropolitan and other risk areas is required by the policies for U.S. civil defense laid down in Presidential Directive 41 and by the September 1980 Title V amendments to the Civil Defense Act.

FEMA believes that such a program should be developed regardless of the level of effort or extent of the Soviet program. The merits of a U.S. program stand on their own feet. It is neither necessary nor desirable to "mirror-image" the Soviet program.

Senator WARNER. What have you learned from your most recent research on Soviet civil defense?

Mr. McCONNELL. FEMA, and its predecessor organizations having responsibility for U.S. civil defense, have considered Soviet civil defense as a research area worthy of continuing study for many years. Knowledge of what the Soviet Union has accomplished in providing protection for its leadership, population and resources is essential to many comparative analyses of the strategic situation. In addition, it is important for a wider audience of U.S. policy makers and analysts to be informed of Soviet achievements in this important area because of its impact on the overall strategic balance. Furthermore, since the Soviet effort is much more extensive and advanced than that of the United States, adaptation of Soviet techniques may be directly useful to the solution of U.S. civil defense problems. The most recent example of FEMA-sponsored research on Soviet civil defense is a March 11, 1981, draft final report, "Soviet Civil Defense Concepts, Programs and Measures for the Protection of Industry in Nuclear War Conditions." This report provides a great deal of documentation on Soviet industrial defense mea-

sures and sheds some light on several poorly understood areas. These include the emphasis the Soviets appear to be giving to two important programs: (1) critical stockpiles for sustaining the population and industrial production and recovery; and (2) rapid economic mobilization (especially in the area of converting civilian production to defense and recovery production). This study provides an updated as well as expanded and detailed analysis of Soviet civil defense efforts to protect industry.

Senator WARNER. It is my understanding that CIA is updating its earlier study on Soviet civil defense that is due for completion this summer. Is FEMA or Defense participating in this study?

Mr. McCONNELL. Yes, a FEMA officer is a member of the Interagency Working Group on Soviet Civil Defense and contributes FEMA insights to the work of the group.

Mr. ESTES. Yes, these ongoing efforts are coordinated by the Interagency Intelligence Working Group on Soviet Civil Defense. FEMA has been part of the Group since its inception in 1976, as has Defense which is represented by the Defense Intelligence Agency, Army, Navy, Air Force, and the National Security Agency. Most recently, the Department of Defense and FEMA participated in the recent updating and publication of the December, 1977 basic study "Soviet Civil Defense; Objectives, Pace, and Effectiveness."

Senator WARNER. Mr. McConnell, does FEMA use the resources of other government agencies such as CIA, DIA, and the Department of Defense in evaluating the Soviet civil defense program?

Mr. McCONNELL. While FEMA has no responsibilities for evaluating Soviet civil defense, we do indeed receive reports, studies, and intelligence findings from the agencies mentioned.

Senator WARNER. The budget documentation states that as one of its research projects FEMA will utilize unclassified sources to examine Soviet civil defense programs for concepts or technologies which could be applied to the U.S. program. Do you think that the U.S. should mirror the Soviet civil defense program?

Mr. McCONNELL. As noted earlier, certain Soviet civil defense concepts and technologies may be applicable in the U.S. The Soviets devote considerably more effort and resources to civil defense than does the U.S. However, as was also noted earlier, FEMA finds it neither necessary nor desirable to attempt to precisely mirror the Soviet civil defense program.

Mr. ESTES. Mirroring the Soviet civil defense program was one option considered during the 1977 PRM-32 review of U.S. civil defense programs and policies. The option was rejected for a variety of reasons, among them major dissimilarities between the domestic political, economic and geographic infrastructures of both countries that make programmatic mirror-imaging inappropriate. The Department of Defense believes that the U.S. civil defense program should seek to provide some increase in the number of surviving population and for greater continuity of government, should deterrence and escalation control fail, in order to provide an improved basis for dealing with the crisis and carrying out eventual national recovery and that the U.S. program should be shaped by U.S. needs and conditions rather than by Soviet programs and practices.

EXCESS PROPERTY

Senator WARNER. What is the status of the excess property, now that the civil defense program has been transferred from the Department of Defense to FEMA?

Mr. McCONNELL. When the Civil Defense functions were transferred to FEMA, the availability of DOD property for reutilization and for loan automatically ceased. FEMA has retained the responsibility for managing nearly 30,000 items previously loaned. The original acquisition cost of the inventory is approximately \$160 million.

Senator WARNER. Has any legislation been proposed?

Mr. McCONNELL. FEMA favors H.R. 1856, introduced by Representative Price, to allow the donation through G.S.A. of the property on loan in place. Representative Mitchell has introduced similar legislation, H.R. 1763. However, it would make FEMA the donee and would require FEMA to certify property conditions to Congress instead of GSA.

COMPREHENSIVE EMERGENCY MANAGEMENT VERSUS CIVIL DEFENSE

Senator WARNER. Mr. McConnell, last year the committee was provided with a table that depicted the fiscal year 1981 civil defense request in terms of comprehensive emergency management vs. civil defense unique. Provide the same break-out for the fiscal year 1982 civil defense request.

Mr. McCONNELL. A year ago we provided estimates of the percentage of the effort devoted to each program element which provided attack-unique capabilities as compared to capabilities essential for attack preparedness which also improve readiness for peacetime emergencies and disasters. The overall estimate was that some 38 percent of the fiscal year 1981 effort provided attack-unique capabilities, while the remaining 62 percent provided capabilities required for both peacetime and attack emergencies. (See Committee on Armed Services, Hearings, Department of Defense Authorization for Appropriations for fiscal year 1981, 96th Cong., 2d Sess., Part 6, at 3603-3604.)

We have not prepared such estimates for the fiscal year 1982 budget for several reasons. The primary reason is that the September 1980 amendments to the Federal Civil Defense Act (viz., the new Title V, "Improved Civil Defense Program," see 94 Stat. 1088-1089) make it clear that the Congress intends that the program be comprehensive in nature, and improve readiness for both attack and peacetime disasters. Thus, there is no longer any necessity for attempting to distinguish attack vs. peacetime-disaster preparedness.

A related reason is that the estimates made for fiscal year 1981 were based on rather rapidly-made estimates by three FEMA Headquarters personnel, on the extent to which crisis relocation plans, warning systems, and other elements of the program could be considered attack-unique. If such estimates were to be made again (and we do not believe they should be), they should be generated more carefully. The approach that should be used would be the so-called "Delphi technique," which is a method for generating judgments and estimates on a consistent basis, from a panel of respondents.

The technique normally provides for three iterations, meaning that the panel is initially queried, then that the initial responses are reviewed by all panel members, who then make new estimates, and finally that the second step is repeated. The most important part of the process is to select a properly structured panel. In the case of the civil defense program, this would require a panel of Headquarters and Regional FEMA personnel with a thorough grasp of all elements of the program, additional members from the State level, and a substantial number from the local level. The latter should be drawn from all parts of the country and from a structured sample of jurisdictions covering the full range of population size and complexity represented by the total "universe" of localities. Experience is to the effect that several months and a large amount of effort are required to generate valid estimates.

We do not believe that such an effort is either warranted or desirable, in view of the September 1980 amendments to the Act. To the contrary, to continue to try to differentiate attack from peacetime-disaster preparedness perpetuates and continues past efforts to make such largely invalid distinctions. The fact is that in the real world, local and State preparedness for all types of emergency is to a large degree one and indivisible. This is elucidated at more length in the attached March 6, 1981, paper ("Comprehensive Emergency Management"), which was provided to the Subcommittee staff prior to the fiscal year 1982 hearings.

Notwithstanding the foregoing, we believe that if we were to estimate the percentage of fiscal year 1982 effort that was attack-unique versus that required for both peacetime and attack emergencies, the estimate would be very close to that for fiscal year 1981. Again, however, we believe that such distinctions have little validity, and need not and should not any longer be made in view of the September 1980 Title V amendment.

(Attachment follows:)

COMPREHENSIVE EMERGENCY MANAGEMENT—MARCH 6, 1981

A considerable amount of heat (but much less light) has been generated in past years in disputes over whether civil defense should be "purely attack-oriented," or whether it should be "comprehensive," including preparation for peacetime emergencies as well. Knowledgeable persons have always known that this dispute was wide of the mark, in that the purported distinction between peacetime-disaster and attack capabilities is largely a false dichotomy. Legislative action in 1980, moreover, has negated what limited validity there may once have been in such a distinction.

The fact is that even if one wished to develop "purely attack-oriented" emergency preparedness, it would be impossible to do so without at the same time improving readiness for peacetime emergencies.

An Emergency Operating Center (EOC), to take one example, is essential for conducting effective, coordinated operations in either a major peacetime emergency or an attack situation. It has been proved time and again in tornadoes,

hurricanes, and similar emergencies that key local (or State) officials need a control center in which they can receive information on the status of a threatening or actual emergency, and on specific problems arising, and can make rapid and coordinated decisions on responses by local forces. It is self-evident that such a control center requires communications to local forces and resources (e.g., police forces, hospitals), to the public, and to other jurisdictions and other levels of government, as well as an emergency power generator, should peacetime disaster or attack effects knock out commercial power.

Such a center has been called an EOC for some 20 years, and an EOC is beyond doubt essential for both peacetime and attack emergencies. To be usable in an attack situation, it requires protection against attack effects such as fallout, but to be usable in many peacetime emergencies, it should have a degree of physical protection which ordinarily also results in substantial fallout protection. Thus, if an EOC is to be able to function in a tornado environment, it should be in a courthouse or city hall basement—which provides fallout protection as well. (In the Lubbock, Texas, tornado of 1970, the tornado struck the city hall, but the EOC in the basement was able to continue functioning.)

Similar considerations apply to all elements of a balanced civil defense capability. Protected broadcast stations (including emergency power) are essential in both peacetime and attack emergencies (also demonstrated at Lubbock), as are warning systems, radiological defense, and other operational systems.

The area of emergency planning further illustrates the difficulty of attempting to distinguish attack from peacetime disaster preparedness. A local (or State) emergency plan in essence specifies the use of locally-available forces and resources in emergency. The chief executive is in charge during an emergency just as he is in charge of (and held responsible for) the operations of government in normal times. Traffic control and maintenance of law and order are the responsibility of the chief of police or sheriff in time of emergency as they are from day to day.

Emergency plans, however, establish organization and procedures for rapid response to rapidly arising, rapidly developing, extraordinary situations—which may range from a chemical spill to a nuclear reactor accident, to a hurricane, to an international crisis, to enemy attack. As noted in the prepared statement for the fiscal year 1982 hearings, there is but one set of resources available to a locality—for example, one police force to expedite traffic flow in an evacuation, whether it be required by a nuclear power plant emergency or an international crisis.

Thus, emergency plans provide for the use of locally available resources in whatever range of emergencies may affect a given locality. Plans provide for the use of nongovernmental resources in addition to those of government. The former may include, for example, local radio stations and other news media, to get information and instructions to the public; physicians, hospitals, and ambulances; and private construction firms.

The operations covered in emergency plans address separate emergency contingencies, and the operations to rescue people trapped or injured by an earthquake, for example, have little in common with those for moving people out of the same area in the event of a peacetime emergency or an acute international crisis. Yet even in the area of planning for separate potential emergencies, the distinction between peacetime and attack contingencies is not so sharp as might at first glance appear.

Crisis relocation plans, for example, provide for evacuating larger cities in a period of acute crisis, and ordinarily have little direct application in peacetime emergencies. This is not invariably the case, however, as shown by Georgia's experience in Hurricane David in the autumn of 1979. A CRP had been prepared for Brunswick, Georgia, and this plan was actually executed when the hurricane threatened Brunswick. The same would be true of CRP's for Biloxi, Galveston, and other coastal cities on the Gulf of Mexico. Moreover, while hurricanes do not threaten Dallas or Boston, CRP's could be useable in the event of other peacetime emergencies such as a rail accident resulting in release of chlorine or other toxic substance, a possible terrorist threat, or some other emergency requiring evacuation.

It is thus clear that "comprehensive emergency management" (more accurately, "preparedness") is not a mere slogan. Rather, it reflects the fact, in the real world, that preparedness for all types of emergency is to a large degree one and indivisible.

The basic point is that essentially all expenditures under the civil defense program are for preparations that would be essential in case of nuclear attack. At the same time, the majority of these expenditures also improve preparedness

for peacetime emergencies, as a "secondary but desirable objective" (to quote DOD policy of most of the 1970's). Moreover, the comprehensive emergency preparedness approach is required by Reorganization Plan No. 3 of 1978 (approved by the Congress), by Presidential Directive 41 of September 1978, and by the September 1980 Title V amendments to the Federal Civil Defence Act—which not only enacted the PD-41 policies as the sense of Congress, but also added specifics making clear that preparedness was to be "comprehensive."

FEMA believes that the comprehensive approach, now mandated by legislation, is desirable on a number of commonsense and practical grounds, including improved motivation to participate, on the part of local and State governments; economy (multiple use of scarce resources); and increased effectiveness.

The motivational factor is based on the fact that civil defense both is and is perceived as being "relevant," rather than a capability sitting on the shelf, waiting for a war that (it is hoped) will never happen. Increased effectiveness results from the fact that peacetime emergencies provide practice for local officials and forces in emergency response similar to that required in a crisis or attack situation. Thus, hurricane evacuations are similar to crisis evacuation; rescue operations following a major earth-quake are similar to those that would be needed following a nuclear air burst (which would not generate a fallout hazard)—and direction and control by key local officials is largely the same in nature, regardless of the type of emergency confronting the jurisdiction.

MOBILIZATION DESIGNEES

Senator WARNER. The fiscal year 1982 budget request does not include funding for the mobilization designees. Why is this program not included in the fiscal year 1982 request?

Mr. McCONNELL. The former Director of FEMA, in view of budget objectives and other priorities, made the decision to delete a request for MOBDES program funds for fiscal year 1982.

Senator WARNER. Mr. Estes and Mr. Gallagher, last year the Congress amended the Federal Civil Defense Act that, in essence, codified Presidential Directive (PD) 41, expressed the sense of Congress for an improved civil defense program, and outlined various program elements for an improved program. What impact has this legislation had on the civil defense program?

Mr. GALLAGHER. The legislation has had little direct or specific impact on the program, since the fiscal year 1982 program addresses the program elements outlined in Sec. 502 (b) of the September 1980 amendments, as did the fiscal year 1981 program—to the extent feasible under the overall funding levels specified for fiscal year's 1981 and 1982. However, we believe that the September 1980 amendments are nevertheless of great importance, as they establish that both the Congress and the Executive Branch are in accord as to policies for the program and the various elements comprising it. The amendments may also assist in the area of appropriations, in that they express the sense of Congress for an improved program.

Mr. ESTES. The Department believes that any legislation that effectively endorses the Administration's civil defense policy objectives and program efforts facilitates the attainment of those objectives and the fruition of those efforts. This is precisely what the fiscal year 1981 Amendment accomplished by showing unity between the Congress and the Executive Branch over the goals of our civil defense policy and the means whereby those goals may be obtained. At the same time it allows the Administration the flexibility required to manage the program's scale and pace in response to changing needs.

TWO-YEAR BUDGET REQUEST

Senator WARNER. Though the Congressional Budget Act requires requests for budget authority to contain two fiscal years, the civil defense request includes only one year. The Senate Armed Services Committee report on the fiscal year 1980 Defense Authorization bill and the fiscal year 1981 civil defense hearings cited this omission.

Mr. Gallagher, why is FEMA again disregarding the Congressional Budget Act and the Senate Armed Services Committee's specific request for a two year civil defense program? Have you discussed this directly with OMB?

Mr. GALLAGHER. The FEMA authorization request is for a specific dollar amount for fiscal year 1982 and "such sums as may be necessary" for fiscal year

1983. We have used this language in all our appropriation authorization requests and believe it in compliance with the Congressional Budget Act. We have discussed the matter with OMB. They instructed us to use this language.

CIVIL DEFENSE AUTHORIZATION REQUEST

Senator WARNER. Mr. Gallagher, the committee has not received the legislative proposal requesting authorization of civil defense funds. When will this proposal be forthcoming? Will any other legislation be requested?

Mr. GALLAGHER. We have now furnished the Congress a legislative proposal requesting authorization of civil defense funds. We do not contemplate any further legislative submissions. This does not, however, preempt any action by the new Director when he takes office.

REPROGRAMMING

Senator WARNER. Mr. Gallagher, what is the agreement between FEMA and the Congress on the reprogramming of funds within the Civil Defense program?

Mr. GALLAGHER. There are no agreements which are unique to the Civil Defense program. As required by our Senate Appropriations Subcommittee on HUD-Independent Agencies, we advise them of our intention to reprogram funds in the amount of \$250,000 or greater. Our House Appropriations Subcommittee requires that we receive their approval before any such reprogramming can take place.

Senator WARNER. Do the Department of Defense and the NSC participate in the reprogramming process? If so, at what point?

Mr. GALLAGHER. These organizations may become involved in the process as a part of executive branch staffing of reprogramming proposals.

Senator WARNER. Do the Department of Defense and the NSC have the authority to disapprove the request for reprogramming?

Mr. GALLAGHER. The Office of Management and Budget is ultimately responsible for determining whether a reprogramming request is a proper reflection of the President's priorities. As part of the staffing process the views of interested agencies, including DOD and NSC, may be sought. While their views undoubtedly carry considerable weight, they are not necessarily determinative.

D-PRIME

Senator WARNER. Mr. Estes and Mr. McConnell. We have heard that studies and computer modelling exercises conducted in 1977 under Defense Department auspices have conclusively established that a program option called "D-Prime" can insure survival of 80 percent of the population. Do these studies and exercises support this claim? What is DOD's assessment of the "D-Prime" programs's capability and effectiveness?

Mr. ESTES. The purpose of the 1977 Department of Defense study was to highlight relative differences in cost and effectiveness among six alternative civil defense programs, among them a multi-billion dollar seven-year effort known as "D-Prime." To facilitate comparison, each program was assumed to work as advertised. This meant that, in the case of "D-Prime," it was assumed at the outset that 80 percent of the population of hypothesized target areas would in fact have been evacuated and would survive. Since this was an entering assumption rather than one of the study's analytically derived findings, the study itself did not address its validity, and, therefore, does not substantiate the claim.

We are aware of a computer simulation developed around this time for the Defense Civil Preparedness Agency. This simulation predicts the incremental costs and effectiveness of particular program elements, using a mathematical model of a nationwide civil defense crisis relocation effort. The model is highly aggregated and has the capacity to describe effectiveness in terms of numbers of survivors added as a function of changes in the level of effort attributed to specific nationwide program elements. Nevertheless, survival rate factors are among the assumptions built into the model's structure. Since they are effectively treated as parameters, operation of the model adds nothing to their validity. It merely displays their logical consequences. Therefore, simulation exercises employing this model do not per se conclusively validate these underlying assumptions.

It is important, however, to note that the survivability assumptions of the 1977 study and the computer model were derived from opinions of interested civil defense program managers, academics, and contractor personnel. These

opinions were obtained through use of accepted opinion survey techniques. They may indeed be correct. But neither the studies and exercises that use them, nor the statistical rigor with which they were compiled validates a claim for insured 80 percent survivability. That claim appears predicated upon the further assumption that when all nationwide program element requirements are complete (100 percent), the resultant infrastructure will in fact perform as advertised.

The small-scale test bed program that FEMA began in 1981 in the specified areas—and will continue under the Administration's fiscal year 1982 program proposal—should provide information that will help to reduce the level of uncertainty surrounding this assumption.

The only differences between "D-Prime" and the currently proposed program involve scale and pace. "D-Prime" begins nationwide at once. The present program proves the concept in the specified areas before expanding outward to cover the entire country. On the basis of our examination of the supporting evidence and arguments that have been presented to date, DOD finds no reason at the present time to conclude that "D-Prime's" capability and effectiveness is either superior or inferior to the Administration's currently proposed program.

Mr. McCONNELL. FEMA has never claimed or asserted that it has been "conclusively established" that Program D-Prime can "insure" 80 percent survival. Rather, as noted in my statement for the Committee's record, "... it is clear that reasonably effective crisis relocation has great lifesaving potential. Computer analyses have confirmed the obvious. Expected survival in large-scale attacks approximates 80 percent of the U.S. population, assuming good (but not perfect) evacuation of U.S. risk areas prior to attack."

Thus, FEMA has indicated that full deployment of a CD program of the D-Prime type should result in expected survival of on the order of 80 percent of the U.S. population, provided that the bulk of the risk-area population has been evacuated to host areas prior to attack, and provided that fallout protection had been developed and other crisis actions taken. We have moreover indicated that there would be good grounds for confidence that the bulk of our risk area population could be evacuated and protected, given several days to a week after the decision to evacuate and given the full deployment of the systems that would be developed under a program such as D-Prime.

The grounds for this confidence include the likelihood that a nuclear exchange would occur after a period of acute crisis, rather than by surprise (because of the likelihood of Soviet city evacuation, which could prevent up to 100 million needless casualties in the USSR), in turn permitting U.S. crisis relocation (evacuation). We have also stressed, however, that there can be no guarantee of complete assurance of sufficient warning to evacuate U.S. risk areas, and that for this reason the CD program must maintain capabilities to protect the population in-place, in best-available shelter in existing buildings, should time or circumstances preclude crisis evacuation.

The expected performance of civil defense systems has been estimated in a number of studies involving computer modelling. One of these was the 1977 Department of Defense study noted in the question. This study was conducted by the Office of the Assistant Secretary of Defense (Program Analysis and Evaluation), with participation and support by the Defense Civil Preparedness Agency (DCPA) one of FEMA's predecessor agencies. Program "D" (of which D-Prime is a variant) was one of six alternative programs evaluated, and stressed developing crisis relocation (evacuation) capabilities—including both relocation plans and the operational systems needed to realize the full lifesaving potential of crisis relocation. D-Prime differed from "D" only in allowing 7 years, rather than 5, to attain full operating capabilities.

The DOD study evaluated the performance of all six programs in a largescale, mid-1980's attack on both military and urban industrial targets. For programs "D" and D-Prime, total U.S. expected survival was over 80 percent.

The detailed DCPA model used for assessment resulted in expected total survival of some 87 percent, based on the assumptions that (1) risk areas were about 80 percent evacuated; and (2) crisis actions were completed, based on D-Prime preparations and planning, resulting in excellent blast protection having been developed for some 10 million key workers in the risk areas at the time of attack, as well as crisis-upgraded fallout protection in host areas for some 150 million evacuees and host area residents not having access to fallout protection in existing larger buildings. (Some 35 million shelter spaces currently exist in host areas, in buildings identified by the National Shelter Survey, and these were assumed to have been used by evacuees or host-area residents.)

The 80 percent evacuation assumption was believed to be reasonable if not conservative by a panel of social scientists who participated in support of the DOD study. These persons were familiar with studies of and experience in both wartime and peacetime evacuations, and believed that compliance with instructions to evacuate would be "overwhelming"; that "most people, once evacuation orders have been issued, will attempt to get out of the risk areas as fast and as soon as possible"; and that there was no reason to believe that crisis relocation would display characteristics different from those encountered in natural disaster evacuations.

Experience in peacetime evacuations is to the effect that given a developing threat, such as a hurricane, and directions to evacuate by local and State officials, most people will leave endangered areas. In fact, in the November 1979 chlorine leak incident in Mississauga, Ontario (near Toronto), some 250,000 persons were evacuated, a virtually complete (100 percent) evacuation of the threatened area. Reports in hurricanes, however, are usually to the effect that some fraction of the people in low-lying areas fail to evacuate, with estimates ranging from 1 or 2 percent to as high as 15 percent, for different localities.

FEMA therefore believes that the 80 percent evacuation assumption used in the 1977 DOD study was a reasonable, if not indeed a conservative assumption. (The same or similar assumptions have been used in other studies of civil defense performance made by the Arms Control and Disarmament Agency, the Intelligence Community, and others.) At the same time, FEMA is mindful that the success of a crisis evacuation (assuming several days to be available) depends in the last analysis upon human behavior. Also, since it is not possible to have perfect confidence as to how the public would behave in such an unprecedented situation, notwithstanding relatively well-informed judgments by knowledgeable social scientists, it is prudent to err on the side of conservatism in making estimates.

Accordingly, neither FEMA nor its predecessor, DCPA, have ever claimed that "80 percent evacuation of U.S. risk areas, prior to an attack, would result in survival of some 87 percent of the national population" (the figures used in the DCPA input to the DOD study). Rather, we have indicated, as noted previously, that good but not perfect crisis evacuation of U.S. risk areas (implying some 80 percent evacuation, a conservative assumption) could result in expected survival of "approximately" or "on the order of" 80 percent of the U.S. population. (The fact that this formulation includes 80 percent figures for both assumed urban evacuation and total U.S. survival is a coincidence. Not all of the 20 percent of the risk area population assumed to be in cities at the time of attack would become fatalities, but on the other hand there would be fatalities in those host areas experiencing the most severe levels of fallout deposition, even if quite good fallout protection had been developed during the preceding crisis.)

Detailed analyses undertaken by DCPA and FEMA since the 1977 DOD study have given us improved insight into such issues, and improved confidence both in the design of Program D-Prime and in the general predictions of performance outlined above. At the time of the DOD study, all such studies rested on input assumptions which were rather simplistic in principle, though quite complex in detail. The results produced by the computer models used to generate estimates of survival turned to a large degree upon a few basic assumptions, namely, the weight and nature of the attack, the percentage of urban population evacuated, and the level of blast and fallout protection available for those in cities at the time of attack, and of fallout protection for those in rural and other areas not experiencing direct attack effects (blast and heat).

DCPA (and then FEMA) accordingly undertook after the DOD study, the development of a nuclear casualty assessment system which would model the survival process in far greater detail, and would in turn permit evaluation of program elements in terms of casualty reduction. Factors considered explicitly in the system include many which bear on the assumption discussed above; namely, the percentage of people who could be assumed to evacuate. The system thus considers such factors as the number of persons with cars, the availability of fuel for cars and for buses (for people without cars), the impact of having developed (and exercised) plans for traffic control as provided for in D-Prime, the effects of adverse weather on evacuation, and a large number of additional operational, behavioral, and technical factors.

Analyses made in 1980, using this system on an initial basis, suggested that the expected value for the fraction of the risk population evacuated, given full D-Prime deployment, would be some 77 percent. This does not "prove" that the 80

percent evacuation figure used in the 1977 DOD study was "accurate," but it does provide an independent, detailed analytical cross-check that the 80 percent assumption would appear to be a reasonable one.

Analyses made recently using the casualty assessment system also provide insight into expected survival should the percentage of survival turn out to be either greater or less than that assumed (some 80 percent). For heavy attacks, assuming all elements of D-Prime to have been deployed, complete (100 percent) evacuation would raise total survival by some 6 percent of the national population, over expected survival for the case of 80 percent evacuation. Similarly, 60 percent evacuation would reduce total survival by some 6 percent from that expected for 80 percent evacuation, for heavy attacks. Thus, risk-area evacuation percentages of 90 or 70 percent would result in total expected survival of some 3 percent greater or less, respectively, than the survival expected for 80 percent evacuation. These analyses confirm what is intuitively obvious, that survival rates are affected by the degree to which risk areas are evacuated prior to attack, and give a feeling for the amount by which the survival rate would change with changes in the risk area evacuation percentage—again assuming D-Prime capabilities to have been fully deployed.

The system was further used to evaluate the effectiveness of the many elements included in Program D-Prime, such as Emergency Operating Centers, radiological defense, protected broadcast stations, austere shelter stocks, and plans and preparations to produce additional shelter during a crisis. The conclusion reached was that, "Program D-Prime is a well-designed and well-balanced civil defense program when all of the pertinent measures of effectiveness are considered. The high-confidence crisis relocation capability, coupled with the sheltering and warning measures, can be expected to provide a relatively high level of survival, while the attack operations capabilities and shelter stocks not only add to survival but also assure that most of the survivors are uninjured and capable of contributing to reconstitution of the society and ultimate national recovery."

The FEMA assesses Program D-Prime as having potential for good effectiveness (on the order of 80 percent survival) in the most likely situation, in which time permitted evacuating the bulk of the population of U.S. risk areas. FEMA does not, however, claim—nor has it ever claimed—that it is "conclusively established" that D-Prime can "insure" 80 percent survival of the U.S. population. Survival in an actual attack might be either greater or less, of course, depending on the percent of urban evacuation in fact achieved, the weight and nature of the attack, and other factors. D-Prime would also improve total survival substantially, as compared to the current program, even in a situation in which crisis evacuation had not been directed, although total survival would be on the order of some 55 percent, substantially lower than with crisis evacuation.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND TO BE ANSWERED FOR THE HEARING RECORD

REX 80 BRAVO

Senator THURMOND. Mr. Gallagher, what were the major findings of, or lessons learned from last year's Rex 80 Bravo exercise, with respect to our ability to conduct a major emergency mobilization?

Mr. GALLAGHER. The primary lesson learned from Exercise Rex-80 Bravo is that the government has much work to do before it is prepared to mobilize both efficiently and economically in a time of national emergency. Our agency put together a critique of this exercise, as we have following most recent exercises. The critique showed that many of the problems identified in previous exercises have not been corrected or that progress towards the solution is slow. The inescapable conclusion is that we have a long way to go before we have corrected the inadequacies in our mobilization planning. Given the tremendous resources of this country, we could respond to virtually any kind of crisis. However, it is an enormous and complex task. Although much has been done in the area of broad planning and coordination, the ability to respond in the most effective and economical way will require much improvement in the actual preparedness and established capability on the part of all concerned government departments and agencies. Rex-80 Bravo brought to surface a number of administrative and operational areas which need immediate attention. However, basic to the solution to this problem is both a verbal and a fiscal commitment from leaders at the highest level.

CRISIS RELOCATION

Senator THURMOND. Mr. McConnell, a major thrust of your program is "Crisis Relocation Planning," in which you propose to physically move millions of people from "risk" to "host" areas over a period of several days, and there protect them, first from blast, and later from fallout. I have a few questions I would like to ask you about this. There are areas of our country, such as the great Northeast Corridor, where risk areas adjoin and overlap each other for hundreds of miles in all directions. What will you do with all these people? Where are the host areas?

Mr. McCONNELL. The crisis relocation problems of the Northeast Corridor (as well as other areas such as California) have been extensively researched in an effort to identify the problems involved in relocation from highly urbanized areas and to develop solutions. Crisis relocation planning in highly urbanized areas presents a number of problems generally not found in smaller communities. These include problems of travel distance and hosting capacity; requirement for higher than average hosting ratios to avoid excessively long relocation distances; capacities of highways leading from the larger risk areas which are often not sufficient to permit relocation in less than three days; thus requiring use of non-highway modes of transportation; competition for hosting space with smaller outlying risk areas; potential for high fallout levels precluding use of a substantial number of counties as host areas; and a requirement for relocation across State lines (as in New England).

Despite these problems, research and specific study has shown that even in the Northeast Corridor, crisis relocation is feasible although it will take somewhat longer than three days to completely evacuate the larger cities such as New York, Boston, Philadelphia and Washington, D.C. The research has provided recommended allocations of the risk area residents in the Northeast Corridor to host areas, and these allocations are currently being refined by State planners. It was determined that the risk populations could be provided temporary lodging in host area non-residential buildings if the desirable allocation of 40 square feet per person were reduced to a lesser amount. The research also indicated that the average relocation distance, at the reduced temporary lodging space allotment, would be about 100 miles and that the maximum travel distance would not exceed about 290 miles.

The Northeast Corridor risk population (i.e., those residents in areas expected to be subjected to overpressures of 2 psi or greater) would be evacuated to host areas located in portions of the States (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and West Virginia) that would not be exposed to such weapons effects.

Senator THURMOND. Other risk areas are surrounded by natural barriers with escape limited by choke points. Los Angeles is surrounded by mountains, deserts, and the ocean, and has only 5 freeways leading out of it. Manhattan is an island with escape limited to a handful of bridges and tunnels, through which the entire population of Long Island must move as well. Again, what will you do with all these people?

Mr. McCONNELL. A 1978 study, "Crisis Relocation of the Population At Risk in the New York Metropolitan Area," indicates that it would be feasible to evacuate the 11.3 million persons considered to be at risk. New York City residents would be moved upstate to host areas, and such movement could be effected with proper planning and if instructions and schedules are followed. However, such evacuation would require additional transportation resources (e.g., buses, trains, planes and boats) in addition to privately owned vehicles; and would not likely be accomplished in less than 3½ or 4 days. A transportation feasibility study was also made on crisis relocation in California. Hosting facilities in Southern California are very limited and reduced space allocations on the order of 15 square feet per person may have to be used in some places. Families in private residences in host areas may be requested to voluntarily share their residences with evacuees (a practice which often occurs in peacetime disasters requiring evacuation). Despite such problems, the feasibility study established the viability of the crisis relocation concept for California, with study participants including State highway police and other State and local representatives.

Senator THURMOND. It is one thing to detect radioactive fallout with your instrument and know it is there, but how can you physically protect those millions

of people from it in a host area, which may be largely rural and have hardly any buildings?

Mr. McCONNELL. Generally, risk area residents are assigned to host areas which have some capability to accommodate evacuee needs for lodging, feeding, and fallout protection. Thus, while most of the U.S. utilizes a hosting ratio on the order of two evacuees for every host area resident, in the Northeast Corridor it is likely that such hosting will need to be increased to about 5 to 1 and in California, the hosting ratio may be as high as 7 or 8 to 1. Fallout protection is generally provided by upgrading the inherent protection available in existing facilities by the addition of earth to the exterior walls and on the roof or floor over the shelter area. This earth acts as a shield to attenuate the radiation from fallout particles that may be deposited on the ground and roof of the building.

Most completed plans call for the utilization of existing buildings for fallout protection and upgrading. We are not aware of any completed plans which contemplate using expedient shelters in lieu of upgrading existing facilities. However, if this is required, there is information available on the construction of expedient shelters to provide the necessary fallout protection.

Senator THURMOND. Mr. McConnell, you have estimated that between the end of fiscal years 1981 and 1982, the degree of completion of your Crisis Relocation Plans will advance from 24 to 34 percent, and that it will take until the end of this decade to complete these plans. Why does it take so long to make a plan?

Mr. McCONNELL. The time required to complete the CRP effort depends upon the resources available. Up until fiscal year 1981, only 145 planners were available. This was increased to 205 planners in fiscal year 1981 and will be continued at that level in fiscal year 1982. The overall CRP effort includes not only movement planning, but also accommodating evacuee needs in the host areas. This includes identifying facilities and procedures for reception and care, how evacuees are to be fed, redirecting the distribution systems for such resources as food and fuel, planning for evacuee medical support, planning to protect property and provide personal security in evacuated risk areas, planning for fire protection and rescue functions, planning for movement of risk area residents who do not have their own vehicle for transportation, providing fallout protection for evacuees and host area residents, planning for the movement of equipment and supplies to host areas, planning for continuation of essential industries in risk areas, and developing emergency information materials for the public. These are time consuming functions. Depending on the size of the community, a typical host area plan may require on the order of 200 workdays to complete and a risk area plan on the order of 300 workdays. Given the limited resources available to accomplish the planning effort, and the fact that some 3,300 plans are required, it will take until roughly the end of the decade to complete planning.

Senator WARNER. We will adjourn the hearing. Thank you ladies and gentlemen.

[Thereupon, at 3:26 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

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